THE INVESTIGATION OF EFFECTIVE INTERVENTION ON TEXAS BORDER AND NON-BORDER KINDERGARTEN ENGLISH LEARNERS' ENGLISH ORAL LANGUAGE DEVELOPMENT

A Dissertation

by

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ABSTRACT

Increasing number of public-school students are identified as English Learner (ELs) at lower grade levels in the United States. Compared to native speaking peers, ELs lack the English proficiency needed to achieve academically. Kindergarten is a critical point for ELs to develop English oral language proficiency, which is associated with subsequent reading performance and overall academic achievement. The Texas-Mexico border region is home to more than 12 million people, a large number of whom speak Spanish as their home language. The purpose of this dissertation is to compare Texas border and non-border ELs' oral language performance and examine effective interventions which may support kindergarten ELs' oral language development.

To better understand the problem and its significance, I provide a systematic review of effective interventions regarding the development of kindergarten ELs' English oral language proficiency. I also compare Texas border and non-border district ELs' English oral language development via the TELPAS speaking test. In the last portion of the dissertation, I examine the effect of a science-infused, literacy intervention on ELs' English oral language proficiency in a Texas border district and a non-border district. The results of the dissertation are supposed to provide practitioners and researchers with implications in terms of the development of ELs' English oral language proficiency.

DEDICATION

This dissertation is dedicated to my parents and grandparents, who inspired and supported my pursuit of doctoral degree.

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I would like to express my sincere gratitude to my committee chair, Dr. Tong, for her support, encouragement, patience and thorough comments and recommendations over the past five years. I also express my thanks to my committee members and the PIs of the projects, Dr. Irby and Dr. Lara-Alecio, for their guidance and support in helping me grow as a qualified educator and researcher. Enormous gratitude also goes to another committee member, Dr. Kwok. Thank you for your constructive and supportive feedback.

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The last empirical study (Chapter IV) included data derived from the federally funded validation study titled, English Language and Literacy Acquisition-Validation (ELLA-V) (Award Number: U411B120047). The project was sponsored by the Investing in Innovation (i3) Fund from the U.S. Department of Education. The supervisors of the projects include Dr. Lara-Alecio, Dr. Irby, and Dr. Tong.

The purpose of Project ELLA-V was to validate the curriculum component of a previous Project ELLA via a randomized controlled trial in terms of investigating the efficacy of structured English immersion and transitional bilingual education models. Data from kindergarten in the school year 2016-2017 was utilized in the study.

All other work conducted for the dissertation was completed by the student independently.

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CHAPTER I

INTRODUCTION

As the United States is becoming more ethnically and linguistically diverse, English learners (ELs) comprise the fastest growing subset of the U.S. public school population. According to the most recent national statistics, the percentage of public-school students who are identified as ELs was 9.6% (4.9 million) in fall 2016, as compared to 8.1% (3.8 million) in fall 2000 (National Center for Education Statistics [NCES], 2019). In addition to increasing in number, this group of students is also becoming increasingly diverse in terms of culture, ethnicity, native language, previous academic experience in their home country, and proficiency level of their first language (U.S. Department of Education, 2017), which should be considered as part of school districts' approaches to education (National Academic of Science, Engineering, and Medicine, 2017, 2018). Among all states, Texas (the subject state of this dissertation) reported the second highest percentage of students identified as ELs (17.2%) among its public schools in fall 2016 (NCES, 2019).

In 2015, the Every Student Succeeds Act (ESSA) was initiated to promote equity throughout the nation for low-income students, English learners, and students of color (U.S. Department of Education, 2018b). ESSA not only directly addressed the resource gap among public schools, but it emphasized the importance of evidence-based practice and intervention for school improvement (Cook-Harvey, et al., 2016). Prior to ESSA, the central goal of the No Child Left Behind Act (NCLB) was to narrow the achievement

gap between students of various social and economic background (Blank, 2011). However, as identified in previous studies that compared to their native English-speaking peers, ELs tend to lag behind in their academic achievement (Chapa, 2013; Day, 2017; Goldenberg & Wagner, 2015; Kazakoff, Macaruso, & Hook, 2018; Rojas, Hiebert, Gusewski, & Francis; 2019). As displayed in NCES (2019) reports, ELs underperform compared to their non-EL counterparts on the 4th grade National Assessment of Educational Progress (NAEP) reading test, and this gap also existed in 8th grade NAEP reading test.

With a large proportion of ELs in the student population (Smith & Murillo, 2013) attending border schools, which are located at the Texas-Mexico border, these districts often face the challenge of addressing the needs of students whose native language is not English (McRobbie & Villegas, 2004). In addition, ELs in border region schools consistently experience cultural conflicts (Lopez, 2010) and need extra time to adapt to new school and community culture (Horowitz, 2012). Moreover, it is challenging for border schools to recruit and retain highly qualified teachers with content knowledge and exposure to border-crossing issues to serve ELs (Sloat, et al., 2007). Therefore, it is not surprising that compared to their counterparts in non-border schools, children in border school perform lower on state standardized tests, including the Texas Assessment of Knowledge and Skills (TAKS) in reading (Sloat et al., 2007) and State of Texas Assessment of Academic Readiness (STAAR) reading test (Tang, Wang, & Min, 2019).

According to National Center for Education Statistics (NCES, 2018a), there is a higher percentage of public-school students identified as ELs at early grade levels.

Serving as the initial stage of formal education, academic development in kindergarten has a significant effect on students' future academic performance (McClelland, Acock, & Morrison, 2006). Researchers have also suggested that ELs' oral language proficiency is positively related to their reading performance (Palacios & Kibler, 2016; Proctor, August, Carlo, & Snow, 2006; Swanson, Rosston, Gerber, & Solari, 2008; Yesil-Dagli, 2011). Especially at the kindergarten level, the primary focus of ELs' academic instruction should be the development of their English oral language proficiency (Marietta & Brookover, 2011).

To explore effective interventions that support kindergarten ELs' oral language development, I conducted three studies: (a) a systematic review of literature, (b) an empirical study comparison between border and non-border kindergarten ELs' English oral proficiency using TELPAS speaking test scores, and (c) a case study evaluating the effect of a science-infused literacy intervention on kindergarten ELs' oral language proficiency. The results of this dissertation will provide practical advice on pedagogy for teachers of kindergarten EL students and these strategies' implications on the improvement of English oral proficiency.

Statement of the Problem

Though a consistently growing part of the K-12 student population, ELs have been reported to experience a significant academic achievement gap in English literacy compared to their non-EL peers (McFarland et al., 2019; Tong, Irby, Lara-Alecio, & Koch, 2014). The development of ELs' oral language proficiency at early elementary grade level has a significant impact on their future academic performance (McClelland

et al., 2006; Ray & Smith, 2010). It is, therefore, the primary goal of elementary school, especially kindergarten, teachers to facilitate ELs' oral language development (Marietta & Brookover, 2011). The U.S-Mexico border region is one of the fastest growing communities in the through the turn of the 21st century (Martinez, 2010), with over 40,000 students crossing the border to enter schools in the United States (Orraca, Rocha, & Vargas, 2017). Many of the students in border region schools are identified as ELs, who are in the process of learning English (McRobbie & Villegas, 2004; Smith & Murillo, 2013).

It has been well documented in previous studies that effective intervention has a positive impact on kindergarten ELs' oral language proficiency (Kim, 2008; Spycher, 2009). However, I have found no study conducted which summarizes the literature on this topic. Moreover, Texas border school districts' ELs' oral language proficiency has not been thoroughly investigated. The purpose of this dissertation is to explore kindergarten ELs' English oral language performance in Texas border and non-border school districts and investigate effective interventions that support the development of kindergarten ELs' English oral proficiency.

Assumptions of the Study

It is assumed in the current study that a science-infused literacy intervention has a significant and positive effect on kindergarten ELs' English oral language development via the investigation of two school districts. In addition, it is also presumed that there is a difference between Texas border and non-border school district regarding their kindergarten ELs' English oral language performance.

Research Questions

The primary interest of the study is to examine effective approaches to facilitate the development of kindergarten ELs' oral language proficiency in Texas border and non-border school districts. Four research questions are proposed in Chapter II to guide the study:

1. What are the characteristics of the EL students involved in the studies (i.e., native language, location, SES background)?
2. What bilingual program types were used in these studies?
3. What was the impact of instructional intervention on kindergarten ELs' oral language development?
4. What instruments were applied to measure ELs' English oral language proficiency?

In Chapter III, three research questions were considered:

1. Was there a significant improvement of both Texas border and non-border school districts regarding EL students' English proficiency level at beginning, intermediate, advanced, and advanced high by the TELPAS speaking test from 2013-2018 school years?
2. Over time, did Texas border school districts significantly differ from non-border school districts regarding the percentage of students rated as beginning, intermediate, advanced, and advanced high level by the kindergarten TELPAS speaking test?

Additional research questions were proposed in Chapter IV:

1. To what extent do kindergarten ELs receiving a science-infused literacy intervention differ from those in a typical practice in a control bilingual classroom in regards to their oral English development?
2. Do ELs from a border suburban school district significantly differ from ELs in a non-order urban school districts regarding their oral language development?
3. Does a science-infused literacy intervention better support a border school district than a non-border school district regarding ELs' English oral language development?

Limitations

One of the limitations of the second study (Chapter III) is that I was not available to retrieve some of the border school districts' TELPAS data in kindergarten. Furthermore, due to this limited availability of public data, only two characteristics were applied to pair border and non-border school districts. Moreover, the empirical study (Chapter IV) is a case study, which involved only one border district and one non-border district. It is, therefore, limited by a lack of generalizability due to its limited sample.

Definitions of Terms

Basic Interpersonal Communication Skills (BICS)

BICS refers to students' conversational fluency in a language (Cummins, 2008).

Bilingualism

Bilinguals use two or more languages in their everyday life (Grosjean, 2010). This definition of bilingualism emphasizes the regular use of languages instead of fluency of the language (Baker, 2011).

Border School District

School districts with any portion of their physical boundary located at or within 20 linear miles of the U.S.-Mexico border were defined as border school districts (Sloat, Makkonen, & Kowhler, 2007).

Cognitive Academic Language Proficiency (CALP)

CALP refers to students' ability to understand and express school-relevant concepts and ideas in both oral and written modes (Cummins, 2008).

Content and Language Integrated Learning (CLIL)

CLIL is a broad term that includes all relevant activities where a second language is used as a tool for students to learn content subject (Coyle, 2007). It is regarded as one of the most effective language learning approaches (Dalton-Puffer, 2007).

English Language and Literacy Acquisition-Validation (ELLA-V) Project

Project ELLA-V, funded by the Office of Innovation and Improvement in 2013 (i3-U.S. Department of Education; U411B120047), aims at validating the intervention components of the previous ELLA project. The project was implemented in 75 elementary schools across Texas in grade K through 3rd.

English Learner (EL)

An EL is defined as a student who speaks another language other than English as their primary language and is in the process of acquiring English is identified as EL (Texas Education Agency [TEA], 2017). The following three terms are used interchangeably "English language learner," "English learner," and "Limited English Proficient (LEP)". It is required by Texas state policy that every student who is

identified as an EL should be provided with the full opportunity to participate in bilingual education or an English as Second Language (ESL) program (TEA, 2018).

English Oral Language Development

Oral language development contains but is not limited to students' listening and speaking skills, and has a great impact on students' future academic learning (August & Shanahan, 2006). The development of students' oral language proficiency also includes the following elements: acquisition of academic and domain specific vocabulary, phonological awareness of language sounds, morphological knowledge of words, syntactical knowledge of grammar, pragmatic knowledge of social standards, and discourse knowledge to oral conversation (Fisher & Frey, 2018).

First Language (L1)

A first language, or L1, also referred as native language or mother tongue, is the language a child acquires first from birth. The development of children's first language is not considered a barrier to their second language acquisition (Nguyen, Shin, & Krashen, 2001). For bilingual Latino/a students, their first language is Spanish.

Randomized Controlled Trial (RCT)

In an RCT study, random assignment is used by researchers to form two groups of participants. Groups that are similar in certain characteristics may interpret differences in outcomes or results as exclusively from intervention when random assignment is carried out correctly (What Works Clearinghouse, 2011).

Second Language (L2)

A second language, or L2, is the target language, other than the L1, learned by a child through classroom activities or other target language environment (Krashen & Terrel, 1983). For a bilingual, Latino student, their second language is English.

Transnationalism

Applied in different fields, the term transnationalism in the study refers to students travel across the national border of the US and Mexico (de la Piedra, Araujo, & Esquinca, 2018). It involves not only individual students but also their social relationship network, communities, and political structures.

Structure of the Study

In this dissertation, I selected the journal article format including three professional journal papers. In the first chapter, I present the introduction of this dissertation study, including the following components: the statement of purpose, definitions of academic terms, and significance. The following three chapters are three individual journal-ready articles. The final chapter, the conclusion, includes the recommendations for future study.

Chapter II-Journal Manuscript I

The first article (Chapter II) is a systematic review exploring effective interventions and approaches. I provided a summary of the common characteristics of a practical intervention that could be applied to support kindergarten ELs' English oral language development.

Chapter III-Journal Manuscript II

The second article (Chapter III) is a data-driven study with secondary data retrieved from a public database. The results of Chapter III indicated that kindergarten ELs in Texas border school districts lagged behind their peers in oral English proficiency as measured by the TELPAS speaking test. Such patterns were consistent over the span of five years. The results of this chapter also suggested that as time went by, both border and non-border school districts had significant improvement regarding the percentage of students rated as advanced level on the test.

Chapter IV-Journal Manuscript III

The last article, Chapter IV, provides empirical evidence based on data derived from a randomized control trial (RCT) project. The results of Chapter IV highlight the significant effects of a science-infused literacy intervention on kindergarten ELs' English oral language development.

CHAPTER II

A SYSTEMATIC REVIEW OF EFFECTIVE INSTRUCTIONAL INTERVENTIONS IN SUPPORTING KINDERGARTEN ENGLISH LEARNERS' ENGLISH ORAL LANGUAGE DEVELOPMENT

Introduction

English Learners (ELs) account for the fastest growing population in U.S. public schools, with an increase from 4.3 million (9.1%) in 2004-05 school year to 4.6 million (9.4%) in 2014-2015 school year (National Center for Education Statistics [NCES], 2018a). NCES (2018a) further reported that in fall 2015, there was a larger proportion of public-school students who were identified as ELs at lower grade levels (e.g., 16.3% in kindergarten) as compared to those in upper grades (e.g., 10.0% in Grade 5 and 6.6% in Grade 8). Regarding geographic concentration, the state of California reported the highest percentage of EL enrollment at 21%, followed by Texas at 16.8% (NCES, 2018a). In comparison to their non-EL counterparts, ELs tend to be at higher risk of performing poorly on various academic disciplines, such as math and reading (U.S. Department of Education, 2017). For example, ELs performed significantly lower in reading at 4th grade with 37 points lower than the average score of their non-EL peers (NCES, 2018b). Furthermore, ELs have a significantly lower high school 4-year graduation rate (Fisher & Frey, 2018). These ELs are equipped with limited academic English proficiency, which presents a grand challenge for researchers and practitioners as how to better support ELs with quality instruction so as to improve their academic performance, and to be compliant with Every Student Succeed Act (ESEA; Barrow &

Markman-Pithers, 2016). Additionally, it is a major challenge for schools to prepare ELs with native like English proficiency to make academic achievement under the pressure of ESSA where there is a shift toward accountability policies for schools (Barrow & Markman-Pithers, 2016; Schanzenbach, Bauer, & Mumford, 2016).

Oral Language among ELs in Kindergarten

It is well documented in previous studies that there is a positive relationship between ELs' oral language proficiency and their reading performance (Carlisle, Beeman, Davis, & Spharim, 1999; Manis, Lindsey, & Bailey, 2004; Miller et al., 2006; Palacios & Kibler, 2016; Proctor, August, Carlo, & Snow, 2006; Swanson, Rosston, Gerber, & Solari, 2008; Yesil-Dagli, 2011). In addition, oral English proficiency is associated with subsequent English literacy skills for young ELs, which also impact later school success (August & Shanahan, 2006; Fernald & Weisleder, 2011; Genesee, 2016). The development of ELs' oral language is also vital to their academic success at school and professional development in the future (Genesee, Lindholm--Leary, Saunders, & Christian, 2005; Saeed, Khaksari, Eng, & Ghani, 2016; Saunders & O'Brien, 2006). However, despite the important role of oral language development plays in ELs' academic life, limited empirical studies have been conducted to explore ELs' oral language development (Genesee et al., 2005; Genesee, 2016) and there is a need for direct instructional support for ELs' oral language development (Genesee, 2016).

The definition of oral language proficiency is not limited to listening and speaking; it involves multiple elements, which might in turn impact students' future academic learning (August & Shanahan, 2006; Francis, Rivera, Lesaux, Kieffer, &

Rivera, 2006; Turkan, De Oliveira, Lee, & Phelps, 2014). These elements include acquisition of academic and domain-specific vocabulary, phonological awareness of the sounds of a language, morphological knowledge of word parts and forms, syntactical knowledge of the grammatical rules, pragmatic knowledge of the social rules, and discourse knowledge to develop oral communication (Fisher & Frey, 2018).

The formal schooling of oral language begins in the kindergarten year, which has a significant effect on children's current and future academic success (McClelland, Acock, & Morrison, 2006; Ray & Smith, 2010; Schulting, Malone, & Dodge, 2005) because during that year, children learn and develop memory, basic math and literacy skills, and build fundamental science knowledge (Ray & Smith, 2010). A growing body of research has been conducted to investigate issues related to kindergarten ELs' oral language proficiency, such as language interaction and oral language development (Farnsworth, 2012; Williams & Pilonieta, 2012); the impact of school or home factor on oral English proficiency (Miranda, 2011; Palacios & Kibler, 2016); connection between ELs' first and second oral language development (Lucero, 2018). These studies suggested that ELs' oral English proficiency at an early age has a critical impact on their subsequent academic performance, which further underscores the need for effective oral language instruction to better prepare ELs.

Although positive findings on oral language among Kindergarten ELs have been reported from interventional research (e.g. Kim, 2008; Spycher, 2009; Tong, Lara-Alecio, Irby, Mathes, & Kwok, 2008), after searching, I found that no study has comprehensively and systematically synthesized the literature on this topic. What is

available in the literature includes meta-analyses and research syntheses on program effectiveness with a special focus on ELs' reading achievement (e.g., Cheung & Slavin, 2012; Rolstad, Mahoney, & Glass, 2005; Slavin & Cheung, 2005). The review performed by Marulis and Neuman (2010) on the effectiveness of vocabulary intervention on pre-k and kindergarten children's oral language development did not focus on ELs and contained insufficient information on interventions and program that could be utilized to support the development of ELs' oral language proficiency. Therefore, the purpose of the chapter is to systematically review studies that implemented effective oral interventions on kindergarten ELs. In an era with increased school accountability, such a review is particularly timely.

Definition of ELs and Types of Bilingual Program

The term of English learners describes students who are "in the process of actively acquiring English, and whose primary language is one other than English" (Bardack, 2010, p.7). In the United States, under *Every Student Succeeds Act*, ELs are mandated to take annual assessment on their English language proficiency, and state governments are responsible for providing accommodations for these students on the assessments (U.S. DOE, 2018b).

There are two commonly adopted bilingual models serving ELs: Transitional Bilingual Education (TBE) and Dual Language (DL) Immersion program (Lara-Alecio, Galloway, Irby, Rodriguez, & Gomez, 2004). In the TBE model, both students' native language and English are applied as medium of instruction during a transitional period to support learners whose L1 is not English (Murphey, 2014). The primary goal of this

model is to gradually diminish the use of learners' primary language and mainstream them into an English-only instruction classroom (Murphey, 2014). TBE provides both early exit and late exit model, the first model provides some initial instruction in students' L1 and expect L1 instruction to phase out rapidly by Grade 2, while the latter model usually serves ELs from kindergarten through Grade 6 and students receive 40% of L1 instruction time (Lara-Alecio et al, 2004). In a DL immersion program, students are served in both English and another language with no intention to diminish the use of primary language. There are two forms of DL programs: the one-way model and the two-way model. The DL one-way model is designed for ELs to participate with their first language applied as instructional language, and English is taught as a second language (Gomez, Freeman, & Freeman, 2010). The DL two-way model allows both ELs and native English speakers to participate and receive instruction in two languages (Lindholm-Leary, 2016).

The Present Study

The goal of this study was to systematically review studies addressing the development of kindergarten ELs' oral language proficiency through instructional intervention. In this review, I address the following research questions:

1. What are the characteristics of EL students involved in the studies (i.e., native language, location, SES background)?
2. What bilingual program types were used in these studies?
3. What was the impact of instructional intervention on kindergarten ELs' oral language development?

4. What instruments were applied to measure ELs' English oral language proficiency?

Method

Selection Criteria

According to Gough, Oliver, and Thomas (2012), a systematic review is "a review of the research literature using systematic and explicit accountable methods" (p. 261). It serves as a functional approach to critically synthesize and organize collected research material (Moher, Liberati, Tetzlaff, Altman, and PRISMA Group, 2010). I adopted features described by Cooper et al. (2009) in conducting systematic review in the current study. In order to capture all relevant studies related to the development of kindergarten ELs' oral language development, I collaborated with a professional librarian, whose responsibilities included conducting literature reviews in the field of health and medical science (Cooper & Crum, 2013). Inclusion criteria for screening include the following:

a. research participants included ELs in kindergarten;

b. research outcomes of the study included English oral language development;

c. research involved an intervention that aimed at improving the quality of instruction, which led to oral language development ;

d. intervention studies included pre and post assessment;

e. research was conducted in the United States; and

f. studies were peer-reviewed quantitative studies.

In addition to the inclusion criteria, exclusion criteria were also applied to select studies that best fit the research purpose. Excluded studies were

a. studies using kindergarten students' oral language outcome as baseline or predictor of later reading or writing performance, which meant there was no report on their performance at the kindergarten year independently;

b. studies including outcomes other than the six components of oral language proficiency outlined by Fisher and Frey (2018);

c. studies conducted to analyze the psychometrician characteristic of an instrument designed to measure oral language development of kindergarten ELs;

d. studies conducted in other English-speaking countries with ELs;

e. master's theses and doctoral dissertations.

Location and Selection of Studies

In an attempt to locate every study that might meet the inclusion criteria, a comprehensive and systematic search of articles written between January 2000 and October 2018 was conducted. Electronic searches were made in the following databases**:** ERIC, Linguistics and Language Behavior Abstracts, Academic Search Ultimate, Education Source, and Psyco Info. A primary search was conducted in each database based on different combination of keywords. Descriptors included: English learner (EL), English language learner (ELL), English as Second Language (ESL), Limited English Speaking, English oral language development, oral language proficiency, verbal communication, and kindergarten. As a supplementary measure, I also searched targeted educational journals including: *Bilingual Research Journal, Elementary School Journal, Journal of Multilingual & Multicultural Development, Language and Education,* and *Early Childhood Research.* An initial search resulted in 202 bibliographic entries. After

being imported into Rayyan (Elmagarmid et al., 2014) for deletion due to duplication, 93 duplicate studies were removed. There were 109 unique studies. Each article was indexed by searching primary keywords and was assigned to two raters, myself and an enlisted doctoral student studying educational psychology, for initial screening on title and abstract. We worked independently to review the titles, abstracts, and keywords of these articles for possible inclusion or exclusion by applying the selection criteria stated above. Eighty-six studies were excluded during the process for the following reasons: the study did not focus on oral language development, the study was a non-quantitative study, the study was not conducted in the United States, the study's participants were not kindergarten children, or the study was a psychometric analysis of an instrument focused on kindergarten ELs' English oral development. The remaining 23 studies were downloaded for further analysis. I further applied exclusion criteria to disregard 16 studies, resulting in 7 empirical studies (Table 1). I present a flowchart in Figure 1 to outline the decision-making process following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher et al., 2010).

Table 1 List of Studies Included for Final In-depth Review

Author	Journal	Title
Rebecca Silverman	*The Elementary School Journal*	A Comparison of Three Methods of Vocabulary Instruction during Read-Alouds in Kindergarten
Fuhui Tong, Rafael Lara-Alecio, Beverly Irby, Patricia Mathes, and Oi-man Kwok	*American Educational Research Journal*	Accelerating Early Academic Oral English Development in Transitional Bilingual and Structured English Immersion Programs
Fuhui Tong, Beverly Irby, Rafael Lara-Alecio, and Patricia Mathes	*Hispanic Journal of Behavioral Sciences*	English and Spanish Acquisition by Hispanic Second Graders in Developmental Bilingual Programs: A 3-Year Longitudinal Randomized Study
Fuhui Tong, Beverly Irby, Rafael Lara-Alecio, Myeongsun Yoon, and Patricia Mathes	*The Elementary School Journal*	Hispanic English Learners' Responses to Longitudinal English Instructional Intervention and the Effect of Gender: A Multilevel Analysis
Saunders William, Barbara Foorman, and Coleen Carlson	*The Elementary School Journal*	Is a Separate Block of Time for Oral English Language Development in Programs for English Learners Needed?
Pamela Spycher	*The Elementary School Journal*	Learning academic language through science in two linguistically diverse kindergarten classes
Youb Kim	*The Modern Language Journal*	The Effects of Integrated Language-Based Instruction in Elementary ESL Learning

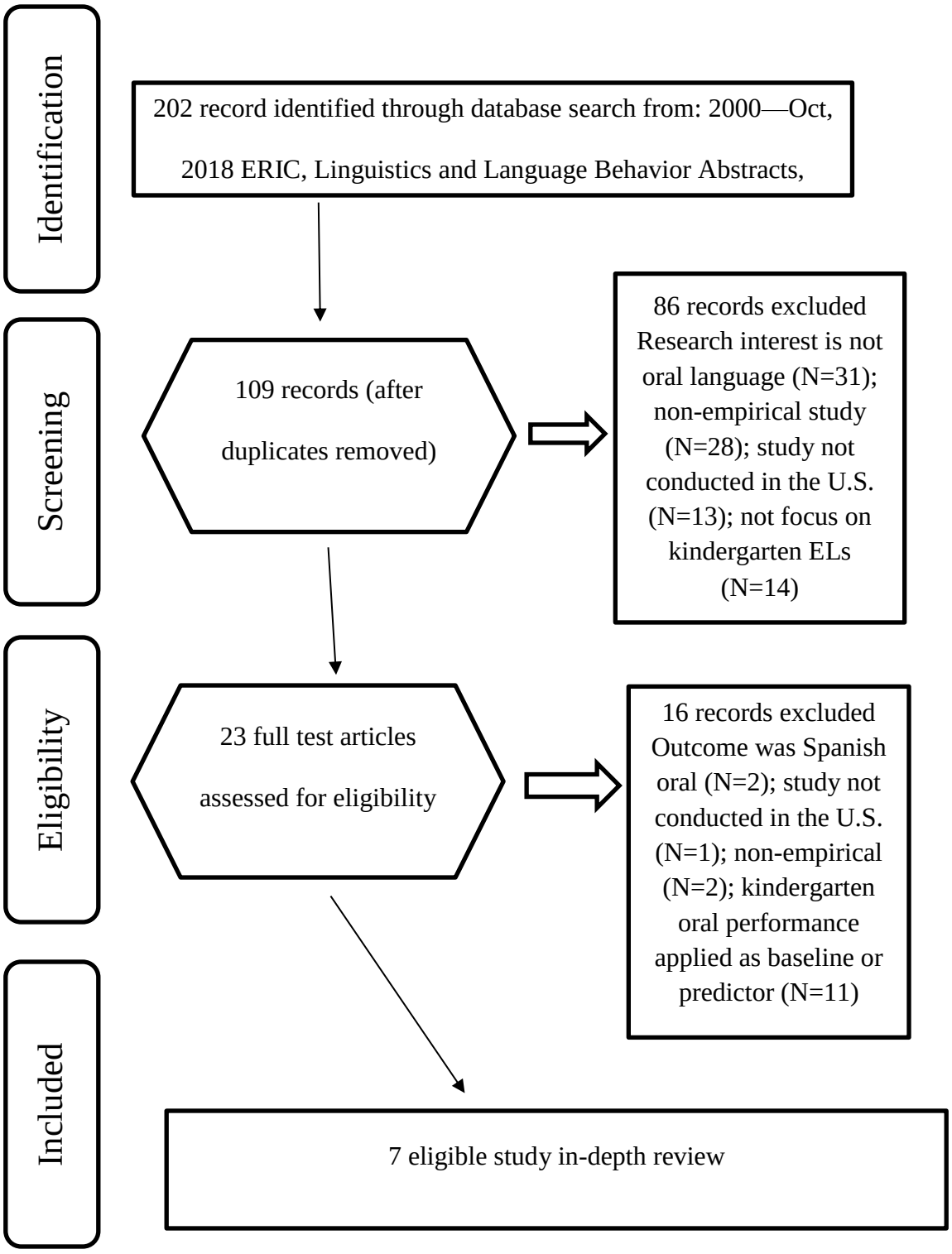

Figure 1 PRISMA flow chart on retrieved sources.

Results

A total of seven studies inclusive of approximately 2,602 kindergarten children met the inclusion criteria for this review exploring the impact of instructional intervention on the development of kindergarten ELs' oral English proficiency. Results are presented in four sections that address the research questions: participant characteristics of the studies, types of bilingual models, interventions designed to improve ELs' oral language development, and instruments applied to measure students' oral language proficiency.

Participants

Among the seven studies, five exclusively focused on ELs. One included both ELs (38%) and non-ELs (i.e., Silverman, 2007) which reported English language status as a non-significant covariate on ELs' oral vocabulary learning (Silverman, 2007). Another includes both ELs (54%) and non-ELs (Spycher, 2009) and reported that there's no significant difference found between ELs and non-ELs regarding the number of words they knew in both treatment and control conditions. The majority of ELs in these studies were from low socioeconomic status (SES) backgrounds, which was determined by whether they qualified for the free or reduced lunch program. I also found that participants in all of the studies were native Spanish speakers, except the one by Kim (2008) in which two participants spoke Chinese and Korean as their first language. Five studies were conducted in California and Texas. The other two studies (Kim, 2008; Silverman, 2007) did not provide specific information on the location of their studies.

Program Types

Among the seven studies, four of them reported the types of bilingual programs students were enrolled in, with one describing an English immersion program (Tong et al., 2010) and the other three studies involving multiple types of bilingual programs, such as transitional bilingual programs (Saunders, Foorman, & Carlson, 2006; Tong, Lara-Alecio et al., 2008; Tong, Irby et al., 2008); immersion programs (Saunders et al., 2006; Tong, Lara-Alecio et al., 2008; Tong, Irby et al., 2010), maintenance programs (Saunders et al., 2006; Tong, Irby et al., 2008) and a dual-language program (i.e. Saunders et al., 2006).

Detail description of bilingual program types were provided in three of the studies (Tong, Lara-Alecio et al., 2008; Tong, Irby et al., 2008; Tong et al., 2010). For example, Tong, Irby et al. (2008) reported that their intervention was conducted in the 70/30 (Spanish/English) developmental bilingual education program at kindergarten. Spanish was applied as medium of instruction in all content areas including language arts, math, science and social studies. Tong et al. (2010) also explained that the students in the study were placed in structured English immersion program, where all instruction was delivered in English. Saunders et al. (2006) only reported the quantity of participating schools classified into one of the four program types, no detailed information of the implementation of these programs were provided.

Intervention

In this section, I categorize the seven studies into three general group based on the types of intervention implemented in the studies: language-based interventions, oral vocabulary-based interventions, and whole-school interventions.

Language-based Intervention

Kim (2008) examined two language-based programs in developing young learners' oral language proficiency with two kindergarten ELs in a Midwestern state. The intervention duration was 10 weeks, and both participants received integrated (oral + written) language based and oral language-based interventions twice in different order. A total of four themes were included in the instruction: food, places we live, clothing, and transportation. Integrated language-based intervention consisted of four steps: (a) teacher reading a story or pictures based on the theme; (b) pre-journal writing activity to develop students' oral language development and writing skills; (c) students reading their personal journal by themselves or with teacher; and (d) a review of words and sentences covered in the session. As for the oral language-based instruction, reading and writing were not involved in this type of intervention. Three steps were implemented in oral-language based instruction: (a) students listening to teachers' explanation of a story or pictures while looking at the pictures; (b) oral interaction with teacher on game or conversation where the main idea of the story was discussed; and (c) oral review of what was covered in the session. Each student received intervention of 12 instructional sessions based on two themes for each type of instruction. A 30-minute mini lesson and daily pre- and post-assessment of oral language use was implemented for every

instructional session with the purposes of expanding learners' vocabulary in the theme and helping them use complete sentence with more than one word. Results of the study suggested that integrated oral + written language instruction is more beneficial for students' oral language development compared to oral language instruction only. It further indicated that literacy should be taken into consideration at the beginning of ELs' instruction.

Oral Vocabulary Intervention

Spycher (2009) examined the effectiveness of a vocabulary intervention that targeted young learners' English oral language development. The study lasted over 5 weeks with 39 kindergarten students in 2 self-contained science classrooms with the same teacher in an urban school of California. The control class received implicit instruction with exposure to academic vocabulary through regular science instruction and teacher read-aloud. The treatment class received intentional instructional intervention with explicit instruction on academic vocabulary, such as choral reading and teacher-provided student-friendly definitions in addition to traditional science instruction. Students in intentional instructional class spent 20 to 25 minutes each day learning three to six academic words based on the science lesson during a week. As treatment class received extra instruction on their vocabulary lessons, the control class engaged in other regular classroom activities. The selection of words taught in the treatment class followed the "three-tier" concept by Beck, McKeown, & Kucan (2002), which categorized words as tier 1 or basic everyday word, tier 2 or high-utility academic words, and tier 3 or discipline-bound academic words. Coaching was also applied to

support the teacher before the implementation of the intervention. Findings of the study demonstrated that students in the intervention class recognized more target vocabulary and could elaborate more on scientific concepts compared to their control peers.

English Language and Literacy Acquisition (ELLA)

Three closely related studies retrieved from a large 4-year longitudinal randomized research project ELLA were included in this review (Tong, Lara-Alecio, et al., 2008; Tong, Irby et al., 2008; Tong, et al., 2010). To be more specific, kindergarten students in project ELLA received 75 minutes of an ESL block every day, including 25 minutes allocated to Story Retelling and higher-order thinking for English Literacy and Language Acquisition (STELLA; Irby, Lara-Alecio, Quiros, Mathes, & Rodriguez, 2004), 10 minutes on teacher conducted Academic Oral Language (AOL) and 40 minutes to Santillana Intensive English, which is a research-based instruction in teaching Spanish speaker content area in kindergarten and first grade (Ventriglia & Gonzalez, 2000). In the first study, Tong, Lara-Alecio et al. (2008) examined the effectiveness of the 2-year oral English intervention from the beginning of kindergarten to the end of first grade. Participants were 534 ELs from 23 schools in TBE and Structured English Immersion (SEI) programs. The findings of the study suggested that students in both program types made significantly positive growth in their English oral language. Further, students receiving enhanced instruction developed at a faster rate than those with typical instruction. In the second study (Tong et al., 2010), researchers followed ELs who were enrolled in SEI programs from kindergarten to the end of second grade. A total of 339 students participated in the study in kindergarten. Based on the descriptive statistics, at

the end of kindergarten, male students in ELLA condition numerically outperformed their peers in the control condition at phonological skills and oral proficiency. It was further suggested that girls develop faster than boys in the area of phonological skills. A parallel study was conducted by the research team to track students enrolled in TBE programs K-2 (Tong, Irby et al., 2008). A total of 19 schools were randomly assigned to treatment ELLA (N=10) or control (N=9) conditions. Students in the treatment condition received an enhanced developmental bilingual education program with a 70% Spanish and 30% English instruction model, whereas those in the control condition received traditional bilingual model with 80% Spanish and 20% English. The initial sample included 502 students, and by the end of the year there were 489 students in the project. Tong, Irby et al. (2008) found that students in ELLA conditions outperformed their counterparts in control conditions in the area of phonological awareness after the first year of intervention.

Silverman (2007) compared the effectiveness of three vocabulary teaching approaches: (a) contextual instruction; (b) analytical instruction; and (c) anchored instruction among 94 children. Developed based on the findings of Teale and Martinez (1993) and Dickinson and Smith (1994), the contextual instruction method provides curriculum with all instructional time devoted to foster discussion of new words learning from story and in relation to students' personal experiences. The analytical method was designed based on studies of Dickinson and Smith (1994) and Beck and McKeown (2001). In the analytical curriculum, children first learn target words through discussion of the context of the words and their personal experience, then they analyze these words

by applying them into various other contexts. Anchored instruction was developed based on Beck and McKeown (2001) and Juel, Biancarosa, Coler, and Deffes (2003). The technique includes phonological and orthographic aspects of words. In anchored curriculum, students need not only discuss target words in context and in relation to personal experience, but they must also compare and contrast words and further attend to sounds and spelling of target words. The findings suggested that anchored and analytical instruction are more effective in terms of improving children's oral vocabulary learning than contextual instruction.

Whole-school Interventions

Saunders et al. (2006) investigated the effectiveness of separate English language development (ELD) into a separate instruction block. A total of 35 schools with 85 kindergarten classrooms serving 1399 students participated in the study. Students in each classroom received either oral English language development through a separate ELD or regular reading/language arts instructional block without a separate ELD. Classroom observation was conducted to monitor the process of ELD or non-ELD classrooms. It was found in the study that ELs benefited more from classrooms with ELD blocks because instructors provided them with more opportunities to engage in oral language and literacy activities. It was found that students in classrooms with a separate ELD block demonstrated a modest but significantly higher performance on oral language development than those without.

Measurement

This section elaborates on measurements that were applied to measure ELs' oral language proficiency in English in the studies including standardized assessment as well as researcher-developed instruments.

Woodcock Language Proficiency Battery-Revised (WLPB-R; Woodcock, 1991) was the most commonly administered instrument to measure students' oral language development in the studies reviewed. This is a standardized instrument with both English and Spanish forms assessing a broad range of proficiency in oral language, language comprehension, reading, and writing. The English norms of the WLPB-R were obtained from 6,359 native English-speaking subjects from age 2 to 99 years, including 3,245 students in K-12. Construct, content, and concurrent validity information were provided in the test manual (Woodcock, 1991). Students' oral language skills can be assessed with five subtests: picture vocabulary, listening comprehension, oral vocabulary, memory for sentences, listening comprehension, and verbal analogies. In the picture vocabulary subtest, based on the guidance of the examiner, test takers need to match words with pictures and pronounce the words when displayed a picture. This is an expressive semantic task to measure students' vocabulary knowledge. In the listening comprehension subtest, examiners read a passage and test takers listen to the passage and fill in the single missing word at the end of the passage. In the verbal analogies test, test takers need to provide verbal answers to questions that involve logical relationships. Cognitive ability was also assessed through the verbal analogies subtest in addition to oral language proficiency. Through the review process, I found that four out of the seven

studies used picture vocabulary and listening comprehension subtests (Saunders et al., 2006; Tong, Lara-Alecio et al., 2008; Tong, Irby et al., 2008; Tong et al., 2010).

Woodcock-Munoz Language Survey (WMLS-R; Woodcock & Munoz-Sandoval, 1993) was also included in one of the studies (Kim, 2008). It is a norm-referenced instrument with sets of tests to examine students' English and Spanish language proficiency across multiple domains, including oral language, language comprehension, reading and writing. The English norms of the WMLS-R were obtained from 8,818 participants from age 2 to over 90. Each form of WMLS-R consists of seven tests, and the combination of these tests form clusters to measure different domains. Three clusters could be applied to evaluate students' oral language development, including oral language cluster, oral expression cluster, and oral language-total cluster. The oral language cluster briefly measures listening and speaking skills and comprises two subtests, picture vocabulary and verbal analogies. The oral expression cluster measures expressive vocabulary, language comprehension and development, and memory and comprises two subtests, picture vocabulary and story recall. The oral language-total cluster measures a wide range of language competency and comprises four subtests, picture vocabulary, verbal analogies, understanding directions, and story recall.

Test of Oral Language Development P:3 (TOLD; Newcomer & Hammill, 1997) is another standardized norm-referenced instrument that measures children's receptive and expressive spoken language competence. Silverman (2007) applied TOLD to measure students' general vocabulary knowledge with three core subtests: picture vocabulary, relational vocabulary, and oral vocabulary. Picture vocabulary is a semantic

subtest that contains 34 items to assess the extent to which the test taker understands the meanings of oral English words. Test takers respond by pointing to the pictures that represent the meaning of the word spoken by the examiner. Relational vocabulary is a semantic subtest that consists 34 items to measure students' understanding of two stimulus words. Test takers first understand the meaning of the spoken words, then recognize the semantic category of the words, and orally explain the relationship between the words. Oral vocabulary is another semantic subtest with 38 items to assess a student's ability to explain the meaning of common English words that is given by the examiner.

Finally, Comprehensive Test of Phonological Processing (CTOPP) is a norm-referenced instrument used to measure students' ability in phonological awareness, memory, and rapid naming. Norming of the instrument was based on a sample of 1636 students ranging from 5 to 24 years; half the participants were elementary school students. CTOPP contains 13 subtests, and four of them were administered in Tong et al.'s (2008) study: blending phonemes into words, rapid object naming, rapid letter naming, and segmenting words. Blending phonemes into words is a 20-item subtest that requires test takers to first listen to sounds produced on an audio cassette recording and then combine the string of phonemic sounds into words. Rapid object naming contains 72 items, in which test takers need to name a series of six objects that are randomly displayed in a 4X9 table as quickly as possible. Rapid letter naming is a 72-item subtest that requires test takers to recognize a string of six letters that display randomly in a 4X9

table. Segmenting words contains 20 items, which is a supplemental subtest that requires test takers to identify target words separated into phonemes.

Researcher-developed Instrument

In addition to the standardized assessments reported in the seven studies, researchers also relied on self-developed instrument to collect outcomes. For example, Spycher (2009) developed the Emergent Science Vocabulary Assessment (ESVA), an individually-administered picture test to measure students' oral language through their receptive vocabulary knowledge. The design of ESVA used the Peabody Picture Vocabulary Test-Third Edition (PPVT-III; Dunn & Dunn, 1997) as a model with 20 academic vocabulary words that were taught during the intervention. Validity and reliability of the instrument were examined through a pilot study which yielded a good fit for measuring students' target vocabulary knowledge. In addition to the 20 words retrieved from the intervention, another 10 words that students were more familiar with were also included in the ESVA. During the assessment, students were shown a 2X2 table containing four color photographs. Students were asked to follow tester's instruction such as "pointing to the target word" and choose the photograph that represented the word. The other three distracting choices were appealing to the students, semantically related, and phonologically related to the target word.

Kim (2008) used a daily picture descriptions informal test before and after the intervention to evaluate the effect of treatment intervention on students' oral language development. Each daily picture description task was administered for 2 minutes and 50 seconds. For each theme, students were presented with displays of four pictures.

Students were required to follow one of the general prompts used for daily picture description tasks, including “tell me what you see in this picture,” “please tell me what you see in this picture ,” or “can you tell me what you see in this picture.” The four pictures displayed under one theme were selected from three categories: (a) defining moments (Immunex Corporation, 2001), which included real life picture from a commercial calendar; (b) Oxford picture dictionary for kids (Keyes, 1998), two colorful illustrations were selected from this commercially developed picture book for ESL students; and (c) pictures composition (Heaton, 1966), black-and-white, two-tone illustration pictures were chosen from this picture book, which was also developed for ESL students to guide composition. The scoring of this daily assessment was additive and consisted of the following five areas: total number of words students used; pragmatic acceptability—students’ appropriate response to teachers’ questions; semantic acceptability— students accurate description of the picture; syntactic acceptability—students’ use grammatically appropriate sentences; and absence of promoting—students’ reaction to general prompts during daily tasks. Finally, Silverman (2007) designed the researcher vocabulary assessment (RVA) to measure students’ word knowledge two weeks prior to and right after the intervention. This assessment consisted of two orally administered subtests: a picture subtest and an oral vocabulary measure. For the receptive picture subtest, students needed to choose one out of four pictures that best represented the target word given by the tester. For the expressive oral subtest, students were asked to define the target word orally. The total possible score for each subtest was 30, and for each correct response, one point was given to the student. Before students

took the actual assessment, practice items were provided to students to make sure they understood the task.

Discussion

Existing literature has confirmed the importance of early oral language proficiency that can significantly predict ELs' subsequent reading or writing performance at upper grade levels (Dennis, Krach, McCreery, & Navarro, 2018; Kendeou, Van Den Broek, White & Lynch, 2009; Pullen & Justice, 2003; Spira, Bracken, & Fischel, 2005). In this systematic review, I have explored multiple forms of intervention that aimed at improving kindergarten ELs' oral language development and instruments that have been used to measure oral skills. The discussion is presented in the order of the research questions.

With over 90% of participants from either California or Texas State, findings of this review are consistent with the distribution of ELs in the United States. According to NCES (2019), by fall 2015, California reported the highest percentage of ELs (21%) enrolled in public schools, followed by Texas (16.8%). However, it must be noted that there is a significant number of ELs in other states. Future research should consider investigating ELs' language proficiency in other states with steady increases in their EL population and help these students to make academic progress. Moreover, other than Kim (2008) examined students whose native languages were Chinese and Vietnamese, the rest of the participants were Spanish-speaking ELs. It was reported by NCES (2019) that though Spanish was the most widely spoken home language of ELs in fall 2015, Arabic, Chinese, and Vietnamese were also common home language of ELs. Future

studies should consider examining oral language performance of ELs among more diverse native language backgrounds to identify differences or similarities.

My review of the studies suggest that there were effective intervention programs in improving kindergarten ELs' oral outcomes. Some of these could be adopted broadly among a large group of students. For example, separate ELD block, a whole-school approach with students receive oral English language development through a separate ELD instead of a regular reading instructional block, proved to be successful (Saunders et al., 2006). Three forms of vocabulary interventions had a positive impact on ELs: instructional intervention, analytical instruction, and anchored instruction. These interventions are whole-class or whole-school interventions that could be adopted to serve schools with a high concentration of ELs. Across these promising interventions, several common components were found to be effective. First, students-teacher interaction plays an important role in most of the interventions. Successful models include teachers who provide students with more opportunities to speak and use English to discuss their opinions. For example, in anchored instruction curriculum, students are required to discuss the target word under the context and relate it to their personal experience. Secondly, most of the interventions were designed as an independent, separate English learning block. In these interventions, ELs were provided with extra language learning period to acquire the language. For example, ELLA offered students with a direct and structured English intervention implemented during the ESL block with multiple components. Additionally, teacher training and professional development were implemented in most of the studies. Project ELLA provided teachers and

paraprofessional with biweekly professional development workshops (Tong et al., 2008a). Silverman (2008) also provided individual training to teachers. Saunders et al. (2006) agreed with the importance of providing teacher with professional development about the academic language instruction.

Reviewed studies suggested that the quality of intervention is as important as language of instruction that impact ELs' learning outcomes (Cheung & Slavin, 2012; Tong et al., 2017). Students who are identified as ELs were provided with opportunities to participate in language assistance program (Redford, 2018). The need of ELs varies from state to state; in some states bilingual education programs are required while in other states these programs are developed as needed (Boyle, August, Tabaku, Cole, & Simpson-Baird, 2015). For example, in Texas, a full opportunity to participate in English as Second Language (ESL) or bilingual education program shall be provided for any students who speaks a language other than English as primary language and who is identified as EL (Texas Education Agency [TEA], 2017).

However, due to policy issues and limited resources, not all states can provide qualified dual language program to support ELs (Boyle et al., 2015). Although the use of Els' native language in dual language programs is beneficial for ELs (Ball, 2010; Lindholm-Leary & Genesee, 2014), districts and schools face a variety of challenges implementing these programs, including a shortage of qualified teachers and the additional costs of program development (Boyle et al., 2015). Based on the available resources and the current context, researchers and schools should focus on improving the quality of instruction to foster ELs' academic learning. There are several common

features found in the reviewed studies that are beneficial for ELs' oral language development. Schools and teachers should incorporate these features into their instruction to better serve the academic and language needs of ELs.

Among the instruments implemented in the reviewed studies, there are generally two categories: self-designed instruments and widely adopted standardized tests. The most commonly applied standardized instrument in the reviewed studies was WLPB-R, which was designed to measure a broad range of domains. Based on the content of the intervention, researchers also designed informal tests to measure students' oral language proficiency. Generally, picture tests, a type of assessment that require students to make relationship between spoken vocabulary and images, was the most used testing form. Compared to standardized tests, researcher developed instruments had less generalizability and provided little information on reliability and validity. For future research, other than standardized tests and researcher-developed instrument, state level high-stakes tests should also be evaluated as an appropriate instrument to measure students' performance of various domains.

In addition, in my review I also discovered other elements regarding kindergarten ELs' oral language development. First, it is well documented in previous literature that effective professional development can develop teachers' pedagogical behavior and improve their instructional approach for ELs (Lara-Alecio et al., 2009; Lee & Buxton, 2013b; Tong, Irby, Lara-Alecio, Guerrero, & Tang, 2018). Furthermore, effective professional development supports teachers' instructional development and, in turn, positively impacts students' language performance (Tong, Luo, Irby, Lara-Alecio, &

Rivera, 2017). However, other than the three studies conducted by the ELLA team, the rest of the studies did not provide sufficient information on the components of professional development for teachers. Additionally, though Saunders et al. (2006) suggested the significance of professional development, no evidence was found in the paper on how to support teachers from over 30 schools across two states with efficient and timely training. Virtual professional development (VPD), which integrates situated learning and technology, was applied in studies with participants located across a wide geographic spread. For example, in the validation study of project ELLA, instead of traditional face-to-face professional development, Tong et al. (2018) provided kindergarten teachers scattered across Texas with VPD and found that teachers shared open and positive attitudes towards virtually delivered training. This sheds light on future research that VPD could be an effective way to provide teachers with structured professional development.

According to Fisher and Frey (2018), there are six major elements of oral language proficiency, and these elements are not strictly isolated from each other. Yet, the majority of the reviewed studies measured only two of them: acquisition of academic and domain specific vocabulary and/or phonological awareness of the sounds of a language. Kim (2008) was the only researcher who additionally assessed ELs' oral language proficiency with regards to syntactical knowledge and pragmatic knowledge with a self-designed instrument. The absence of the other elements might be due to the fact that current adopted standardized instruments on oral language proficiency are designed to measure a broad range of language proficiency including reading and

writing, such as WLPB-R and WMLS-R. These instruments were not developed to measure different aspects of oral language development. Furthermore, compared to the measurement of morphological knowledge or discourse knowledge in oral language development, the assessment of phonological awareness and oral vocabulary awareness might be easier and more explicit for researchers and teachers to conduct without additional training. Future research should consider the development of an instrument which can be used to conduct holistic examinations of ELs' oral language proficiency. One of the major components of the Sustainable Development Goals by the United Nations is to ensure quality education and lifelong learning for all (United Nations Educational, Scientific and Cultural Organization, 2015). It is critical to enhance and maintain students' sustainability in language and academic learning. However, none of the reviewed studies followed up the intervention and examined what happened once the intervention was completed as to whether students' oral proficiency was sustained, continued to grow, or decreased. The long term impact of quality intervention is critical for schools and students, especially those with limited resources. Thus, future research should engage in follow-up studies that identify effective strategies which lead to sustained development of students' oral language performance.

CHAPTER III

EXAMINING THE GROWTH TRAJECTORY OF KINDERGARTEN ENGLISH LEARNERS' ORAL LANGUAGE PERFORMANCE IN TEXAS BORDER AND NON-BORDER SCHOOLS

Introduction

La frontera, the U.S.-Mexico border region, is not only the home to around 12 million people (Sloat, Makkonen, & Koehler, 2007), it is also a place where two countries connect and where people have built a unique culture and lifestyle (de la Piedra & Guerra, 2012; Santiago, 2008). Along the Rio Grande River, from El Paso in the west to Brownsville in the south, the Texas portion of the U.S.-Mexico border is about 1248 miles, and over 80% of the population is Hispanic (Méndez & Staudt, 2013). As the fastest growing communities over the last 50 years in the United States (Martinez, 2010), border region contains some of the poorest counties across the nation (Heyman, 2013; Santiago, 2008). In 2015, nearly 40,000 students cross the border to enter schools in the United States with expectations of gaining access to a high quality education (Orraca, Rocha, & Vargas, 2017). Many of these Spanish-speaking border students are designated as English learners (ELs) (McRobbie & Villegas, 2004; Smith & Murillo, 2013) and are reported to be underperforming (Peach & Adkisson, 2000; Levernier, Partridge, & Rickman, 2000; Fullerton, 2001). They face the challenge of achieving grade-level appropriate academic English proficiency, which according to research, usually takes five to seven years to acquire (Cummins, 1980). Further, literature shows that around half of the Mexican-origin border school children drop out of high school before graduation (Deviney, 2011).

Compared to non-border regions, it is rather difficult for the remote border schools to hire and retain well-qualified teachers because of two reasons: (a) teachers in border schools receive

limited training on pedagogies applicable to serve bicultural learners and (b) schools are under pressure to quickly transfer students from transition bilingual classroom to monolingual English only classrooms. Although the majority of population in border region is Spanish-speaking, many schools are eliminating bilingual education programs with culturally and linguistically relevant pedagogy (de la Piedra & Araujo, 2012; McRobbie & Villegas, 2004; Ostorga & Farruggio, 2014).

In summary, border regions face a series of challenges including high poverty rates with disadvantaged children (Anderson & Gerber, 2008; Coppock, 1995; Sloat et al., 2007; Tessman, 2016), a large proportion of Hispanic EL students yet to acquire English proficiency (Alanís, 2000; Cashman & McDermott, 2013; Richardson & Pisani, 2012; Sloat et al., 2007), and limited recourses to enhance teachers' instructional capacity and experience (McRobbie & Villegas, 2004; Sloat et al., 2007). Together, these factors all contribute to the lower academic achievement of this region (Sloat et al., 2007).

However, research addressing the educational development of students along border schools is scarce. Among those studies available, most are qualitative studies with focus on different topics (Orraca et al., 2017) with four key concepts: transnationalism (Brochin Ceballos, 2012; Méndez & Staudt, 2013), bilingualism (Mein & Esquinca, 2014), biliteracy (Brochin Ceballos, 2012; de la Piedra & Araujo, 2012; Smith & Murillo, 2012), and biculturalism (Arreola, 2005). Still, there are certain limitations of these qualitative studies. For example, these studies often have a small sample size, which is not representative of the large population of border school students. Moreover, the majority of these studies used focus groups and interviews as research methods and failed to include students' standardized test data, especially over a period of time. Although standardized testing is subject to criticism, it is not only cost-effective

when evaluating a large group of students' educational outcome (Edwards, 2006), but it also can provide teachers and students with reliable and valid evidence and information regarding their academic performance (Brown & Hattie, 2012). More importantly, it is important to observe students' trajectory of oral proficiency from a developmental perspective with multiple data points (Tong, Irby et al., 2008).

Border regions contains a large proportion of students identified as ELs with unique border crossing backgrounds. These ELs face similar academic challenges (a lack of English proficiency) as non-border ELs; they also encounter other obstacles to closing academic the achievement gap between them and non-ELs. In this paper, I intend to compare the growth trajectories of border and non-border school districts regarding their kindergarten ELs' oral language development. In this paper, I first present a review of literature on transnationalism and border school students' academic performance and the development of their bilingualism, biliteracy, and biculturalism skills. Then a quantitative data analysis was conducted to compare Texas–Mexico border and non-border school districts' progress in supporting the development of their kindergarten ELs' oral language skills.

Literature Review

Transnationalism and Border-crossing Students

Transnationalism generally refers to the movement of students travel between national borders (de la Piedra, Araujo, & Esquinca, 2018). It involves "individuals, their networks of social relations, their communities, and broader institutionalized structures such as local and national governments" (Portes, Guarnizo, & Landolt, 1999, p. 220). Specifically referring to the U.S. and Mexico border, transnational students, or transfronterizxs (Relaño Pastor, 2007; Zentella, 2009), are those who live on the border region and go to school in the United States but

visit Mexico for various reasons from time to time (Monty, 2015). Due to the fact that the majority of the transnational students are from Spanish-speaking families, I use the words "transnational" and "Hispanic" interchangeably in this study to represent this group of students. These border-crossing students have bonds with families in Mexico and the United States and are often influenced by the cultures and languages of both sides (Nelson, Barrera, Skinner, & Fuentes, 2016).

Although transnationalism is becoming more common and many students cross the U.S-Mexico border every day, educators and teachers are not fully prepared to accommodate the needs of these transnational students (Cline & Necochea, 2006; de la Piedra et al., 2018; Gallo & Link, 2015). Moreover, the cultural and linguistic diversity that these transnational students bring to classrooms are not fully valued by mainstream teachers (de la Piedra et al., 2018). For example, Alanís (2000) examined students' linguistic and academic performance in a two-way bilingual program located in the U.S-Mexico border region. It was found that although immersed in a Spanish-dominant region, students were more attracted to English due to pressure from media, community, and schools. These students had not developed well in bilingualism and biliteracy. To better address the diverse academic and linguistic needs of transnational students in border schools, teachers are encouraged to create transnational learning community based on shared experiences which are likely to enable students to apply their funds of knowledge regarding transnationality into their classrooms, which, in turn, would close the bridge between teachers and students (de la Piedra et al., 2018).

Bilingualism, Biliteracy, and Biculturalism Development among Border School Students

Bilingualism refers to individuals "who use two or more languages (or dialects) in their everyday lives" (Grosjean, 2010). As a distinctive region with blended cultures and languages

(de la Piedra et al., 2018), it is well documented in previous studies that both English and Spanish play a critical role in people's daily lives in the U.S.-Mexico border region (Anderson-Mejías 2005, Mejías and Anderson 1988, Mejías, Anderson-Mejías, and Carlson 2003). However, bilingual education in the border region is being negatively impacted by many factors, including the English-only instruction in many schools and high-stakes testing (Escamilla, 2006; McNeil, Coppola, Radigan, & Vasquez Heilig, 2008; Meyer, 2002; Mitchell, 2005; Valenzuela, 2005). Biliteracy refers to the process of creating and explaining literate texts in more than one language (Smith & Murillo, 2012). It serves as a critical construct to understand education in the border region (Smith & Murillo, 2012) and directly relates to students' academic success, which most of the time defined as an individual's ability to read and write academically (Smith & Murillo, 2013). However, students enrolled in local border schools receive limited support regarding the development of biliteracy skills (Smith & Murillo, 2013). In many border schools, Spanish language is not valued in academic settings (Smith & Murillo, 2013), and students are told that school is an English-only place (Diaz, 2011). Biculturalism refers to the integration of behaviors, values, and identities associated with two cultures (Nguyen & Benet-Martinez, 2013). As a result of exposure to internet, immigration, and globalization, an increasing number of individuals are becoming bicultural and multicultural (Hong, Morris, Chiu, & Benet-Martínez, 2000; Nguyen & Benet-Martinez, 2007). Along the border region, biculturalism is featured through interaction with people from both sides (Arreola, 2005).

For example, Esquinca, Araujo, and de la Piedra (2014) examined meaning-making practices in a two-way bilingual program in the U.S.-Mexico border region. The researchers examined 100 out of 300 hours of observation of a fourth-grade teacher's classroom, with a focus on bilingualism/biliteracy and science content instruction. Findings of the study suggested

that teachers' use of scaffolding strategies and meaning-making tools guided students' science learning in both languages and promoted the development of students' higher-order thinking skills. Moreover, it was observed that students had less difficulty in applying both languages to comprehend science concepts.

Even though transnationalism, bilingualism, biliteracy, and biculturalism in border region have been discussed to explore teachers' and students' attitude and perception toward bilingual education or classroom practices in border schools, little has been done to investigate Texas-Mexico border school students' academic achievement and language proficiency. Dow (2008) conducted a longitudinal study to investigate elementary level English learners' academic achievement in dual language programs located in a border district school. Findings indicated that participation in bilingual program in border districts is not an obstacle to students' oral language performance. In addition, ELs' English oral proficiency increased more compared to their Spanish oral proficiency. It was also found that ELs in bilingual program perform much better than students in monolingual programs.

Within Border Districts and Comparison to Non-border Districts

Border schools also vary based on school demographics and achievement. Take Fort Stockton and Laredo independent school districts as an example: both districts are located within 20 miles from the Texas-Mexico border. Fort Stockton has a large Hispanic student population (85.8%) with 66.4% of students identified as economically disadvantaged and 8.7% as ELs. The district had a teacher turnover rate of 26.1% in 2017-2018 (TEA, 2018a). By contrast, the Rio Grande district has a higher percentage of economically disadvantaged students (91.1%) and ELs (70%). Their teacher turnover rate is 7.3%, which is lower than the state average of 16.6%. As another example, Rangel, Loureiro-Rodriguez and Moyna (2015) compared college students'

language attitudes toward English-Spanish code-switching in two Texas border towns (Laredo and Edinburg). Although no significant difference was detected in general regarding attitudes toward language in Laredo and Edinburg, it was found that male students showed higher ratings for Spanish in Laredo, while female students had a preference for Spanish over English in Edinburg. It was summarized in the study that border does not stand for a single and common identity, there are constant variation and changes among different districts.

Furthermore, there also exists vast differences between border and non-border school districts regarding students' academic performance, teacher qualifications, and school demographics. However, only a few studies have compared border and non-border school districts in terms of educational outcomes. For example, Tang et al. (2019) examined the growth trajectory of border and non-border school students' academic performance through standardized reading test. The authors found that fifth grade students in border schools lagged behind on reading achievement, and the gap persisted after five years. It was suggested that teachers in border schools need to be prepared with a teaching philosophy that could further support their students to develop bilingualism, biliteracy, and biculturalism.

Oral Language Development and Border School Students

Based on my review in the previous chapter, oral language development plays a vital role in kindergarten children's academic performance. Saunders et al., (2006) investigated the impact of separate English language development on kindergarten ELs' oral language development. Among 23 schools that participated in the study, 11 of them were located in the Texas-Mexico border.

Taken together, the current studies on border crossing students and their bilingualism, biliteracy, and biculturalism development were mostly qualitative researches that conducted in a

certain border school district. These studies revealed that (a) border crossing ELs underperform their counterparts in non-border region in reading and in general academic performance (Ostorga & Farruggio, 2018; Sloat et al., 2007; Tang et al., 2019); (b) although Spanish language was the home language of many border school students and teachers, it was ignored and marginalized in academic setting (Sarmiento-Arribalzaga & Murillo, 2010; Smith & Murillo, 2012), and ELs were under high pressure to transition to monolingual instruction (Ostorga & Farruggio, 2014); and (c) few studies have been conducted to compare border and non-border district ELs' language proficiency.

Therefore, the purpose of this study is to provide a data-driven profile of border crossing ELs' oral language proficiency. To achieve the purpose, I compare the growth trajectories of border and non-border school kindergarten ELs' oral language development through state English assessment from 2013-2018 school years using a public database. More specifically, this study is guided by the following research questions:

Research Question 1: Was there a significant improvement of both Texas border and non-border school districts regarding EL students' English proficiency level at beginning, intermediate, advanced, and advanced high in the TELPAS speaking test from 2013-2018 school years?

Research Question 2: Over time, did Texas border school districts significantly differ from non-border school districts regarding the percentage of students rated as beginning, intermediate, advanced, and advanced high level in kindergarten TELPAS speaking test?

Method

Research Design and Context

According Texas Education Agency (TEA; 2018b), in the school year of 2017-2018, there were 1,210 public school districts. Sixty-three of these school districts were classified as

border school districts, located 20 miles from the Texas-Mexico border (Sloat et al., 2007). Among these border districts, 7 of them did not have sufficient data, and, therefore, were excluded from the analysis. Based on district type classification by TEA (2018), among the 56 border school districts with available data, there were 2 independent town, 3 major suburban, 3 major urban, 12 non-metropolitan stable, 5 other central city, 19 other central city suburban, and 12 rural districts. In order to pair with these 56 border districts, another balanced sample of 56 non-border school districts were selected that matched the distribution of these district types. Therefore, a total of 112 public school districts were included in this study for final analysis. Through the publicly available database, Texas Assessment Management System (TAMS), I gathered district-level Texas English Language Proficiency Assessment System (TELPAS) speaking test data of kindergarten students for these 112 districts during the period of 2013-2018 school years.

Measurement

According to TEA (2019), TELPAS was designed by the TEA to assess the English language development of students who are identified as ELs. It is applied to evaluate K-12 ELs' English language proficiency in four language domains: listening, speaking, reading, and writing. For students at Grades K to 1, TELPAS includes assessments to holistically rate their language proficiency at four domains based on classroom observation and student interaction. For example, the TELPAS speaking test is used to evaluate students' oral ability to appropriately and effectively engage in learning activities and social interactions.

There are four descriptors to define stages of English language proficiency levels for each language domain (listening, speaking, reading, and writing): beginning, intermediate, advanced, and advanced high. These four descriptors provide information on ELs' English language

performance to understand and engage in grade-appropriate academic activities. According to the descriptors (TEA, 2019), students are classified as "beginning" level if they have little or no English ability to understand and use the language. Students at this category may use a little English but not enough to perform appropriately in social or academic context. Students are classified as "intermediate" level if they show some ability to understand and use the language. Student at this level can perform meaningfully under certain social and academic routine context when the tasks only require the use of simple language structure and high-frequency vocabulary. Students are classified as "advanced" level if they have the ability to understand and use grade-appropriate language to engage in academic activities with ongoing second language acquisition support. Student at this level can perform beyond basic and routine English. Finally, students are classified as "advanced high" level if they have the ability to understand and engage in a grade-appropriate, all English academic setting with minimum second language acquisition support. The above definition of each proficiency level remains consistent across four language domains.

Data Analysis and Model Specification

Utilizing the district-aggregated TELPAS speaking test data, I compared border and non-border school districts' student oral language performance. A growth hierarchical linear model (GHM) was adopted to analyze this multilevel longitudinal dataset since the aggregated data were collected for school years 2013-2018. During the model-building process, four independent models were created and repeated four times for each proficiency level as the outcome. SPSS 24.0 was used to complete these analyses. Model specifications are described in the following section.

Model 1: The Unconditional Model

Beginning with an unconditional model, this analysis provides information about the mean of percentages of students labeled at four language proficiency level in the TELPAS speaking test. It reveals whether school districts generally show variation in these percentages and whether it is plausible to investigate variability over time.

Level-1 Model

$TELPASSpeaking_{ij} = \beta_{0j} + r_{ij}$

Level-2 Model

$\beta_{0j} = \gamma_{00} + u_{0j}$

Mixed Model

$TELPASSpeaking_{ij} = \gamma_{00} + u_{0j} + r_{ij}$ where

$TELPASSpeaking_{ij}$ is the percentage of students labeled at a proficiency level at time *i* for school district *j*,

β_{0j} is the expected mean percentage of students labeled at a proficiency level for an individual school district *j*,

γ_{00} is the expected grand mean percentage of students labeled at a proficiency level across all occasions and school districts,

u_{0j} is the deviation of school district *j* from γ_{00} (i.e., a between-district random effect), and

r_{ij} is the deviation of time *i* from district *j*'s mean percentage of students labeled at a proficiency level (i.e., a within-district random effect)

Model 2: The Unconditional Growth Model (Time Model)

Based on the unconditional model, time is added as a level 1 predictor in this model. This model is built to determine the estimated average growth rate regarding the percentage of

students labeled at a proficiency level in the TELPAS speaking test for the school district each year.

Level-1 Model

$TELPASSpeaking_{ij} = \beta_{0j} + \beta_{1j}*(TIME_{ij}) + r_{ij}$

Level-2 Model

$\beta_{0j} = \gamma_{00} + u_{0j}$

$\beta_{1j} = \gamma_{10}$

Mixed Model

$TELPASSpeaking_{ij} = \gamma_{00} + \gamma_{10}*TIME_{ij} + u_{0j} + r_{ij}$, where

γ_{00} is the expected grand mean of the percentage of students labeled at a proficiency level of the school year 2013-2014 across all selected districts,

γ_{10} is the expected mean growth rate across districts during the school years 2013-2018, and

u_{0j} is the district-level random effect for $\gamma_{00.}$

Model 3: The Conditional Growth Model (Location Model)

Based on the unconditional growth model, location (border *vs*. non-border) is added as a level-2 predictor in this model. By adding this variable, I examined, on average, whether border districts displayed different growth trajectories than non-border school districts regarding the percentage of students labeled at a proficiency level in the TELPAS speaking test.

Level-1 Model

$TELPASSpeaking_{ij} = \beta_{0j} + \beta_{1j}*(TIME_{ij}) + r_{ij}$

Level-2 Model

$\beta_{0j} = \gamma_{00} + \gamma_{01}*(Location_j) + u_{0j}$

$\beta_{1j} = \gamma_{10}$

Mixed Model

$TELPASSPeaking_{ij} = \gamma_{00} + \gamma_{01}*Location_j + \gamma_{10}*TIME_{ij} + u_{0j} + r_{ij}$

γ_{00} is the difference between border and non-border school districts in the percentage of students labeled at a proficiency level in the school year 2013-2014,

u_{0j} is the district-level residual variance (after considering the location of a district) in $\gamma_{01.}$

Model 4: the interaction model

Based on the conditional growth model, this model adds the interaction variable between time and location. By adding this variable, I investigated, as time went by, whether border districts displayed different growth trajectories than non-border school districts regarding the percentage of students labeled at a proficiency level in TELPAS speaking test.

Level-1 Model

$TELPASSpeaking_{ij} = \beta_{0j} + \beta_{1j}*(TIME_{ij}) + r_{ij}$

Level-2 Model

$\beta_{0j} = \gamma_{00} + \gamma_{01}*(Location_j) + u_{0j}$

$\beta_{1j} = \gamma_{10} + \gamma_{11}*(Location_j)$

Mixed Model

$TELPASSpeaking_{ij} = \gamma_{00} + \gamma_{01}*Location_j + \gamma_{10}*TIME_{ij} + \gamma_{11}*Location_j*TIME_{ij} + u_{0j} + r_{ij}$,

where γ_{11} is the coefficient of interaction between school district location (border *vs*. non-border) and time point.

Time, the level-1 predictor, was added to indicate school year 2013-2014 as the reference time point in Models 2, 3, and 4. A total of five time points were created in the analysis to represent corresponding school years from 2013-2014 to 2017-2018. District location (border *vs*. non-border) was the level-2 predictor. In order to examine students' English proficiency level in

TELPAS speaking test, in this current study, I replicated the four models described above four times using percentage of students in beginning, intermediate, advanced, and advanced high rating in TELPAS speaking test as outcomes respectively.

To test model fit, I applied the following formula: $\chi^2 = \text{Deviance}_{\text{Reduced}} - \text{Deviance}_{\text{F}}$ to calculate the difference of deviance (-2loglikelihood) of two models (Model 1 *vs*. Model 2; Model 2 *vs*. Model 3; Model 3 *vs*. Model 4) for each proficiency level. For example, in order to examine whether Model 2 is significantly different from Model 1, in other words, whether it is meaningful to add time as a level-1 predictor in Model 2, I calculated the difference of deviance between Model 1 and Model 2 with the 3.84 as the critical value. If the difference of deviance between Model 2 and Model 1 is larger than the critical value of 3.84, then Model 2 is statistically significantly different from Model 1, which means it is necessary to add time as a level-1 predictor. In addition, I calculated intraclass correlation (ICC): $\text{ICC} = \tau_{00}/(\tau_{00} + \sigma_2)$ to determine the proportion of variance in the outcome (i.e. percentage of students rated as beginning level in TELPAS speaking test) that can be explained by the grouping structure.

Results

Descriptive statistics of border and non-border school districts by proficiency level: beginning, intermediate, advanced, and advanced high in the school year 2013-2014 are displayed in Table 2.

Research Question 1

The first research question was "Was there a significant improvement of both Texas border and non-border school districts regarding students' English proficiency level in the TELPAS speaking test from 2013-2018 school years?"

ICC was calculated based on unconditional model for each of the outcomes to determine the overall variance that could be explained by clustering (i.e. five time points being clustered within a district in this study). The value of ICC was 62%, 27%, 51%, and 65% respectively for four outcomes, the percentage of students labeled at beginning, intermediate, advanced, and advanced high level in TELPAS speaking test. The non-zero ICCs indicated the need to apply multilevel models to adequately analyze this dataset. The parameter estimates of Model 1 by TELPAS proficiency levels are displayed in Table 3.

Time was added as a level-1 predictor in Model 2 (the time model), to answer the first research question. Model fit analysis suggested that the time model is statistically significantly different from the null model in TELPAS intermediate level, with a chi-square value of 5.9, which is larger than the critical value of 3.84. The parameter estimates of the time model by TELPAS proficiency levels are displayed in Table 4. On average, the percentage of kindergarten students rated in TELPAS speaking test beginning, intermediate, advanced, and advanced high level were 41.30, 33.28, 21.03 and 12.70, respectively, in the 2013-2014 school year. In addition, time was only found as a statistically significant predictor regarding the percentage of kindergarten students labeled at advanced level. During 2013-2018, the percentage of students labeled at advanced level increased 0.85 points each year.

Table 2 Descriptive Statistics of Border and Non-border School Districts' TELPAS Oral Language Performance by Proficiency Level for Five School Years

		2013-2014			2014-2015			2015-2016			2016-2017			2017-2018		
	Location	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Speaking Beginning%	Border	54.27	23.45	48	49.75	23.77	48	51.73	20.85	44	45.09	22.48	47	49.28	20.47	47
	Non-Border	31.30	16.01	50	34.43	21.97	51	33.50	22.11	50	32.04	20.17	51	33.45	20.43	47
Speaking Intermediate %	Border	28.81	13.13	48	31.09	11.63	46	29.85	12.44	48	33.59	14.66	49	31.63	13.65	48
	Non-Border	35.77	11.39	52	37.48	19.27	52	37.02	17.31	51	38.96	18.62	52	32.46	13.73	52
Speaking Advanced%	Border	15.18	11.41	44	16.32	13.85	47	16.34	11.42	44	18.96	13.77	47	16.61	10.38	44
	Non-Border	26.18	13.91	51	27.00	14.77	45	23.82	14.75	49	26.57	15.92	49	32.50	17.61	46
Speaking Advanced High %	Border	9.46	10.20	37	10.12	10.40	41	9.38	10.30	40	10.21	10.82	34	9.05	8.77	37
	Non-Border	14.32	11.48	37	14.00	14.95	41	16.29	17.19	35	15.61	14.31	41	14.61	10.71	38

Table 3 Parameter Estimates of Fixed and Random Effects of Model 1 (null model) by Proficiency Level

Speaking Beginning%	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
	Intercept (γ_{00})	40.24	21.69(108)	<.0001
	Random Effects	*Variance*	*Standard Error*	*z*
	Intercept (u_{0j})	325.27	51.04	6.37 (<.0001)
	Residual (r_{ij})	198.81	14.54	13.67(<.0001)
Speaking Intermediate %	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
	Intercept (γ_{00})	33.62	0.96(104)	<.0001
	Random Effects	*Variance*	*Standard Error*	*z*
	Intercept (u_{0j})	61.71	13.90	4.44(<.0001)
	Residual (r_{ij})	167.6	12.02	13.95(<.0001)
Speaking Advanced %	Fixed Effect	Coefficient (SE)	t(*df*)	*p*
	Intercept (γ_{00})	22.72	1.16(104)	<.0001
	Random Effects	*Variance*	*Standard Error*	*z*
	Intercept (u_{0j})	114.58	19.76	5.80 (<.0001)
	Residual (r_{ij})	112.27	8.39	13.38 (<.0001)
Speaking Advanced High%	Fixed Effect	Coefficient (SE)	t(*df*)	*p*
	Intercept (γ_{00})	13.26	1.10(96)	<.0001
	Random Effects	*Variance*	*Standard Error*	*z*
	Intercept (u_{0j})	102.87	17.43	5.90(<.0001)
	Residual (r_{ij})	56.48	4.78	11.81(<.0001)

Table 4 Parameter Estimates of Fixed and Random Effects of Model 2 (time model) by Proficiency Level

Speaking Beginning%	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
	Intercept (γ_{00})	41.30(2.06)	20.02(162)	<.0001
	Time (γ_{10})	-0.54(0.46)	-1.17(379)	0.2416
	Random Effects	*Variance*	*Standard Error*	*z*
	Intercept (u_{0j})	324.87	50.95	6.38 (<.0001)
	Residual (r_{ij})	198.17	14.50	13.67(<.0001)
Speaking Intermediate%	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
	Intercept (γ_{00})	33.28(1.27)	26.24 (272)	<.0001
	Time (γ_{10})	0.17(0.41)	0.42(396)	0.6746
	Random Effects	*Variance*	*Standard Error*	*z*
	Intercept (u_{0j})	61.82	13.91	4.44(<.0001)
	Residual (r_{ij})	167.48	12.01	13.95(<.0001)
Speaking Advanced%	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
	Intercept (γ_{00})	21.03(1.35)	15.62(185)	<.0001
	Time (γ_{10})	0.85 (0.35)	2.44(365)	0.015
	Random Effects	*Variance*	*Standard Error*	*z*
	Intercept (u_{0j})	115.00	19.76	5.82(<.0001)
	Residual (r_{ij})	110.44	8.26	13.38(<.0001)
Speaking Advanced High%	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
	Intercept (γ_{00})	12.70(1.24)	10.26(147)	<.0001
	Time (γ_{10})	0.29(0.28)	1.01(288)	0.3124
	Random Effects	*Variance*	*Standard Error*	*z*
	Intercept (u_{0j})	103.55	17.55	5.90(<.0001)
	Residual (r_{ij})	56.18	4.76	11.80(<.0001)

Research Question 2

The second research question was "Over time, did Texas border school district significantly differ from non-border school districts regarding the percentage of students rated as beginning, intermediate, advanced, and advanced high level in kindergarten TELPAS speaking test?"

To answer the second research question, location (border *vs*. non-border) was added as a level-2 predictor in Model 3, the location model, to investigate the different trajectories of border and non-border districts regarding their percentage of students rated as beginning, intermediate, advanced, and advanced high level in TELPAS speaking test. In comparison to the time model, the location model was significantly different in all four outcomes, with chi-square values at 20.9, 7, 21, and 4.3 for TELPAS beginning, intermediate, advanced, and advanced high, respectively. The parameter estimates of Model 3 (the location model) by TELPAS proficiency level are displayed in Table 5. It shows that location was a statistically significant predictor on the percentage of kindergarten students rated as beginning, intermediate, advanced, and advanced high levels in TELPAS speaking test. In the school year 2013-2014, on average, the percentage of kindergarten students in border school districts rated as beginning, intermediate, advanced, and advanced high level in TELPAS speaking test were 49.77, 30.68, 15.66, and 10.3, respectively, while the percentage of non-border school districts were 33.58, 35.69, 25.76, and 14.88, respectively. The growth rates for the percentage of students rated as each of the four TELPAS proficiency levels remained the same as in the time model.

In addition, the interaction between location (border *vs*. non-border) was added in Model 4, the interaction model, to explore the growth trajectory differences between border and non-border school districts regarding the percentage of kindergarten students rated as beginning, intermediate, advanced and advanced high in TELPAS speaking test. In comparison to the location mode, the chi-square value change of the interaction model was less than the critical value of 3.84, which suggested that the interaction model was not statistically significantly different from the location model in any TELPAS proficiency level. In this interaction model, time remained as a statistically significant predictor on the percentage of students rated as advanced level in TELPAS speaking test. Furthermore, location remained as a statistically significant predictor regarding the percentage of students rated at beginning, intermediate, and advanced level in TELPAS speaking test. However, location was no longer a significant predictor regarding the percentage of students rated as advanced high. Moreover, the interaction between time and location was not a statistically significant predictor for the percentage of students rated as any proficiency level in TELPAS speaking test. The parameter estimates of Model 4, the interaction model by TELPAS proficiency levels are displayed in Table 6.

I found in the interaction model that the percentage of non-border school district kindergarten students rated as beginning, intermediate, advanced, and advanced high level in TELPAS speaking test were 32.15, 36.97, 25.39, and 14.45 respectively in the school year 2013-2014, while the percentage of border school district kindergarten students were 51.25, 29.27, 16.06, and 10.71, respectively. In Texas non-border school districts, the percentage of kindergarten students rated as beginning, advanced, and

advanced high levels in TELPAS speaking test increased by 0.18, 1.06, and 0.49 points annually during 2013-2018. However, the percentage of students rated as intermediate level in TELPAS speaking test decreased 0.47 points annually in non-border school districts. While in Texas border school districts, the percentage of students rated as intermediate, advanced and advanced high levels in TELPAS speaking test increased by 0.87, 0.68, and 0.07 points annually during 2013-2018. However, the percentage of kindergarten students in Texas border districts rated as beginning level decreased by 1.3 points annually during the same time period.

Table 5 Parameter Estimates of Fixed and Random Effects of Model 3 (location model) by Proficiency Level

Speaking Beginning%	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
	Intercept (γ_{00})	33.58(2.49)	13.47(138)	<.0001
	Time (γ_{10})	-0.55(0.46)	-1.20(377)	0.2296
	Location	16.19(3.35)	4.84(106)	<.0001
	Random Effects	Variance	Standard Error	z
	Intercept (u_{0j})	255.10	41.89	6.09(<.0001)
	Residual (r_{ij})	198.95	14.59	13.64(<.0001)
Speaking Intermediate%	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
	Intercept (γ_{00})	35.69(1.52)	23.42(195)	<.0001
	Time (γ_{10})	0.17(0.41)	0.42(395)	0.6732
	Location	-5.01(1.85)	-2.71(102)	0.008
	Random Effects	Variance	Standard Error	z
	Intercept (u_{0j})	54.49	13.03	4.18 (<.0001)
	Residual (r_{ij})	167.96	12.07	13.92(<.0001)
Speaking Advanced%	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
	Intercept (γ_{00})	25.76(1.59)	16.23(152)	<.0001
	Time (γ_{10})	0.87(0.35)	2.48(364)	0.0135
	Location	-10.10(2.08)	-4.86(101)	<.0001
	Random Effects	Variance	Standard Error	z
	Intercept (u_{0j})	87.42	16.15	5.41(<.0001)
	Residual (r_{ij})	111.01	8.32	13.34(<.0001)
Speaking Advanced High%	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
	Intercept (γ_{00})	14.88(1.59)	9.36(125)	<.0001
	Time (γ_{10})	0.28(0.28)	0.98(287)	0.327
	Location	-4.58(2.16)	-2.13(94)	0.0362
	Random Effects	Variance	Standard Error	z
	Intercept (u_{0j})	97.41	16.79	5.80(<.0001)
	Residual (r_{ij})	56.33	4.78	11.78(<.0001)

Table 6 Parameter Estimates of Fixed and Random Effects of Model 4 (interaction model) by Proficiency Level

	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
Speaking Beginning%	Intercept(γ_{00})	32.15(2.64)	12.17(172)	<.0001
	Time (γ_{10})	0.18(0.64)	0.27(377)	0.7840
	Location	19.10(3.80)	5.03(172)	<.0001
	Time*Location (γ_{11})	-1.48(0.92)	-1.61(377)	0.1080
	Random Effects	*Variance*	*Standard Error*	*z*
	Intercept (u_{0j})	254.83	41.80	6.10(<.0001)
	Residual (r_{ij})	197.68	14.50	13.64(<.0001)
Speaking Intermediate%	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
	Intercept(γ_{00})	36.97(1.72)	21.54(281)	<.0001
	Time (γ_{10})	-0.47(0.57)	-0.83(398)	0.4097
	Location	-7.70(2.48)	-3.10(282)	0.0021
	Time*Location (γ_{11})	1.34(0.82)	1.63(395)	0.1041
	Random Effects	*Variance*	*Standard Error*	*z*
	Intercept (u_{0j})	54.72	13.02	4.20(<.0001)
	Residual (r_{ij})	166.84	11.98	13.92(<.0001)
Speaking Advanced%	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
	Intercept(γ_{00})	25.39(1.72)	14.76(2.03)	<.0001
	Time (γ_{10})	1.06(0.49)	2.16(367)	0.0312
	Location	-9.33(2.50)	-3.74(202)	0.0002
	Time*Location (γ_{11})	-0.38(0.70)	-0.55(363)	0.5825
	Random Effects	*Variance*	*Standard Error*	*z*
	Intercept (u_{0j})	87.25	16.13	5.41(<.0001)
	Residual (r_{ij})	110.96	8.32	13.34(<.0001)

Table 6 Continued

	Fixed Effect	Coefficient (SE)	*t*(*df*)	*p*
Speaking Advanced High%	Intercept(γ_{00})	14.45(1.69)	8.56(155)	<.0001
	Time (γ_{10})	0.49(0.40)	1.23(291)	0.2208
	Location	-3.74(2.43)	-1.54(148)	0.1253
	Time*Location (γ_{11})	-0.42(0.56)	-0.75(287)	0.4523
	Random Effects	*Variance*	*Standard Error*	*z*
	Intercept (u_{0j})	97.55	16.81	5.80(<.0001)
	Residual (r_{ij})	56.20	4.77	11.78(<.0001)

Discussion

The purpose of the study was to investigate and compare the growth trajectory of Texas border and non-border school districts in terms of their kindergarten ELs' English oral language performance through the TELPAS speaking test. A growth hierarchical linear model was utilized to analyze this multilevel longitudinal dataset. The same analytic approach was repeated four times to examine the four proficiency level: percentage of kindergarten ELs' rated at beginning, intermediate, advanced, and advanced high level in TELPAS speaking test.

I found that Texas border kindergarten ELs' underperformed compared to their peers in non-border area on TELPAS speaking test. These ELs continued to fall behind over the span of five years. Specifically, I compared Texas border and non-border ELs' English oral proficiency at four TELPAS performance levels. A similar pattern was identified in the three other performance levels (intermediate, advanced, and advanced high), where a lower percentage of border kindergarten ELs were rated at these three upper levels as compared to their peers in non-border areas. This finding is consistent

with previous research that border students face obstacles when taking high-stakes standardized test (Skukauskaite & Bolt, 2017).

According to Cummins (1980), ELs need five to seven years to achieve grade level academic English language proficiency. Based on the findings of the study, no statistically significant improvement was identified among both border and non-border school districts regarding the preparation of ELs rated at higher English proficiency levels during 2013-2018. More importantly, ELs in border school district did not catch up with their counterparts in non-border school districts. Highly impacted by local demographic and geographic traits, ELs who go to school in border region might need extra time to achieve grade-level appropriate English language proficiency. For example, under the context of transnationalism, border school students might spend more time living in a Spanish-dominant environment, where they have less exposure to English language and English reading materials. In addition, they might need to sacrifice some time on travelling for family or changes in parental employment (Tang et al., 2019).

With high pressure to transfer students to monolingual English instruction (Ostorga & Farruggio, 2014), bilingual education programs were eliminated by many border schools (de la Piedra & Araujo, 2012; McRobbie & Villegas, 2004; Ostorga & Farruggio, 2014). However, as indicated by the current study, border school ELs have not made adequate progress in English oral proficiency compared to non-border peers. Researchers have supported bilingual instruction which has positive impact on ELs' English oral language performance (Dow, 2008; Kuo, Ramirez, de Marin, Kim, & Unal-Gezer, 2017; Tong, Irby et al., 2008; Tong, Lara-Alecio, Irby, Mathes, & Kwok, 2008).

Therefore, instead of marginalizing students' use of Spanish in school, schools can promote the teaching and learning of English through Spanish and provide teachers professional development on better serving these bilingual students, capitalizing their border-crossing experiences and Spanish culture backgrounds.

Students in border schools district face many challenges to achieve academically, including poverty (Anderson & Gerber, 2008; Tessman, 2016) and lack of resources to improve teachers' qualification (McRobbie & Villegas, 2004; Sloat et al., 2007). However, limited number of studies have been conducted to investigate border school students', especially ELs', English oral language proficiency in kindergarten. Based on the findings of the current study, there was a consistent gap between border and non-border district ELs regarding their oral language proficiency. More specifically, ELs in border regions showed lower academic performance compared to their counterparts in non-border regions. Such findings are consistent with previous research by Tang et al. (2019). In sum, ELs in border regions are more academically challenged and need adequate and practical support to catch up with ELs in non-border regions and non-ELs. Additional resources, highly qualified teachers, and effective interventional approaches should be provided to border district schools to meet EL students' academic needs. Furthermore, ongoing professional development should be provided to border school teachers regarding their teaching pedagogy and support them to utilize and incorporate ELs' bilingual and bicultural background into the curriculum and support these students' oral language development.

CHAPTER IV

THE EFFECTS OF A SCIENCE-INFUSED LITERACY INTERVENTION ON KINDERGARTEN ENGLISH LEARNERS' ENGLISH ORAL LANGUAGE DEVELOPMENT: A HIERARCHICAL LINEAR MODELLING APPROACH

Introduction

In 2016, around 4.9 million (9.6%) of public school students were identified as English learners (ELs) across the nation (McFarland et al., 2019). Of these students, a higher percentage at lower grade level were identified as ELs. For example, 16.2% of students were identified as ELs in kindergarten, compared to 6.9% in 8th grade, and 4.1% in 12th grade (McFarland et al., 2019). In Texas, where the current study took place, according to 2018-2019 Texas Academic Performance Report (TEA, 2019), 19.5% of public-school students were identified as EL. Unfortunately, ELs are reported to fall behind academically compared to non-ELs, primarily due to a lack of English proficiency For example, in 4th grade, ELs' average National Assessment of Education Progress (NAEP) reading score was 37 points lower than that of their non-EL peers (McFarland et al., 2019). Similar patterns were found in science; in 2015, 4th grade ELs' average NAEP science score was 36 points lower than that of their non-EL counterparts (McFarland et al., 2019). Specifically, in Texas, according to 2018-2019 TAPR report, in the State of Texas Assessments of Academic Readiness (STAAR) reading test, 75% of students across the state were at or above "approaches grade level" while only 56% of ELs were at the same level. In addition, within the state of Texas, 4th grade ELs scored 29 points lower than non-ELs on NAEP science assessment in 2015.

Researchers have confirmed that oral language development at kindergarten has positive and significant effect on children's current and future academic performance (McClelland et al., 2006; Ray & Smith, 2010; Schulting et al., 2005); therefore, the role of oral language development at this grade level is self-evident. In the second study of my dissertation, I compared the growth trajectory of border and non-border ELs' English oral language performance on the TELPAS speaking test. In this chapter, I conducted a case study using data retrieved from a large scale RCT study to examine the effect of a science-infused literacy intervention on ELs' oral language performance in border and non-border school districts.

Literature Review

Content and Language Integrated Learning for ELs

As English learners (ELs) represent a continuously increasing fraction of the U.S. public school population, the diverse needs of these ELs who are in the process of acquiring both English language and academic disciplines should be addressed by teachers and educators (Lee, 2005; Lee & Buxton, 2013a). According to Cummins (1979), ELs develop two types of language proficiency: basic interpersonal language skills (BICS) and cognitive academic language proficiency (CALP). BICS refers to ELs' "conversational fluency in a language" (Cummins, 2008, p. 72), whereas CALP refers to "students' ability to understand and express, in both oral and written modes, concepts and ideas that are relevant to success in school" (Cummins, 2008, p. 72). Moreover, because CALP is associated with higher order thinking and academic content, it is more challenging and takes longer time for ELs to develop the level of proficiency to cope

with academic context (Cummins, 1981; Saunders, Goldernberg, & Marcelletti, 2013). One of the most effective method to support ELs' acquisition of CALP is content and language integrated learning (Navés, 2009).

Content and language integrated learning (CLIL) is an umbrella term that encompasses all activities where a second language serves as a tool in content subject learning (Coyle, 2007). Specifically, Marsh (2002) defined CLIL as activities in which the target language is "used as a tool in the learning of a non-language subject in which both language and the subject have a joint role" (p. 58). Several rationales of second language acquisition support the positive effect of CLIL on learners' second language learning (Dallinger, Jonkmann, Hollm, & Fiege, 2016), including Krashen (1982), Lightbown and Spada (2006), and Long (1990). According to these theories, students can most effectively acquire a second language when they are provided with similar context to acquire their first language (Navés, 2009), which allows them to input and interact with the language in meaningful contexts (Dallinger et al., 2015; Navés, 2009). Therefore, CLIL is considered one of the most effective types of language learning approach because it (a) provides a naturalistic language learning environment; (b) sets the purpose of using language in the classroom; (3) positively impacts students' language learning through emphasizing instruction on language learning rather than form; and (d) increases students' exposure to the target language drastically (Dalton-Puffer, 2007).

Integration of Literacy Practice and Science Learning for Early Elementary ELs

ELs are reported to underperform compared to their non-EL peers in science. For example, in 2015, 4th grade ELs average science score was 37 points lower than non-ELs in National Assessment of Education Progress (NAEP; McFarland et al., 2019). Specifically, in Texas, ELs at 4th grade scored 29 points lower than non-ELs (NCES, 2015). Researchers have called for an urgent need to integrate language/literacy with subject area, especially science, to support the academic needs of ELs (Irby et al., 2019). Given the significant role that oral language development plays on subsequent academic achievement and the benefit of CILI, it is promising to integrate oral English and science content to further facilitate ELs' academic development. Therefore, in the current study, I applied the concept proposed by Tong et al., (2014) that interdisciplinary science-embedded English language and literacy is "a curriculum in which oral English language and reading proficiency is of primary focus, with science being secondary focus to establish context so as to support the learning in the primary domain" (p.411). Beginning in early elementary grades, it is critical for ELs to develop specific skills in learning to read (Linan-Thompson & Hickman-Davis, 2002; Tong, Lara-Alecio et al., 2008). Tong et al. (2014) also suggested that an effective literacy intervention for ELs at early elementary grades should consist of the following components: (a) students are provided with opportunities to practice specific literacy related skills in context; (b) repetitive practice is embedded in the intervention for students to practice; (c) students are supported to discuss with their peers regarding their learning contents; (d) throughout the instruction, hands-on activity, scaffolding and vocabulary instruction are integrated into the curriculum; and (e) students are consistently provided with English language

learning support including graphic organizer, vocabulary scaffolding and partner reading.

It has been suggested in previous studies that the integration of science content and English language development has a positive impact on science performance (Llosa et al., 2016; Maerten-Rivera, Ahn, Lanier, Diaz, & Lee, 2016). For example, Maerten-Rivera et al. (2016) examined the effect of an integrated intervention of science and English language development on elementary school ELs science learning. The intervention emphasized the integration of hands-on, inquiry based science learning with English language learning strategies. It was found in the study that the intervention has a positive impact on ELs science achievement. Furthermore, the study revealed that although the curriculum was targeted at ELs, it could benefit all other students.

Besides the positive effects on science learning, the integration of science learning and English language also show promising influence on ELs' English language development (Lee, 2019; Lee & Buxton, 2013a; Spycher, 2009; Zwiep, Straits, Stone, Bletran, & Furtado, 2011). For example, Spycher (2009) examined the effectiveness of an intervention approach, which integrated science instruction with vocabulary learning, on kindergarten ELs' oral language development. Thirty-nine students of diverse ethnic and linguistic backgrounds with over half of them identified as ELs participated in the study. The intervention lasted over 5 weeks and consisted of 16 vocabulary lessons. Each week, the teacher taught three to six vocabulary words, based on the science lesson. The selected vocabulary taught in the class were high-utility academic words (e.g. search) and discipline-bound academic words (e.g. pollen and metamorphosis).

During instruction, the teacher told students the meaning of the target words based on the science context and provided further examples of each word in other relevant contexts. Moreover, students were encouraged to use the target vocabulary in their own sentence with suggested context. Findings of the study indicated that students exposed to integrated approach learned more target vocabulary and had better understanding of scientific concepts. In addition, according to the post-intervention teacher interview, students were able to make connections between English language and science concepts. Finally, students were using the words they learned during the intervention not only in science class discussion but also in other literacy events.

Based on my findings in the previous chapters, oral language development plays a significant role in ELs academic development and border school districts perform comparatively lower in oral language proficiency as measured by the Texas standardized test, TELPAS. However, limited studies have been conducted to compare ELs' academic performance and language proficiency between border and non-border school districts. Therefore, the purpose of this study is to investigate the effectiveness of a science-infused literacy intervention on ELs' oral language development among border and non-border school districts. The following research questions guide the study.

Research Question 1: to what extent do kindergarten ELs receiving a science-infused literacy intervention differ from those in control bilingual classrooms in their oral English development?

Research Question 2: Do ELs from a border suburban school district significantly differ from ELs in a non-border urban school district regarding their oral language development?

Research Question 3: Does the science-infused literacy intervention better support a border school district than a non-border school district ELs regarding their English oral language development?

Method

Research Design and Context

The current study is derived from a broader randomized controlled trial (RCT) research project, English Language and Literacy Acquisition Validation (ELLA-V; Grant Award No. U411B120047), with the overarching purpose to validate the instructional components designed in a previous RCT study during a 45-minute ESL block (Tong, Irby, & Lara-Alecio, 2015). In project ELLA-V, schools were randomly assigned to two treatment or control groups. The current study is situated within one treatment group to investigate the influence of the science-infused literacy intervention on ELs' oral language development.

The participants in the current study were from two school districts, one border suburban school district (Border ISD) and one non-border urban school district (Non-border ISD). As the major crossing point and busiest inland port along the Texas-Mexico border, the border suburban school district is in the most bilingual city across the nation (Ramos & Sayer, 2017) where over 92% of households report using another non-English language as their home language (Ryan, 2013). According to NCES (2017), in 2016-

2017, there were 20 elementary schools in the school district. The non-border urban school district, in contrast, is located at southeast Texas. It is the largest school district across Texas with around 160 elementary schools. According to the Texas Academic Performance Report in 2017these two school districts differ significantly in district demographics. More specifically, the border district is a Hispanic dominant school district (99.0%), with 93% economically disadvantaged students and 58.3% ELs. Teacher turnover rate in this district is 8.1%, which is significantly lower than the state average level of 16.4%. By contrast, the non-border urban school district has 62.1% Hispanic students, 77.1% economically disadvantaged students, and 31.8% ELs. Teacher turnover rate is 19.0%, which is higher than the state average. Moreover, only 0.7% of teachers hired in the border district do not have a degree, while 6.1% of hired teachers in the non-border district have no degree.

During 2016-2017, *Let's Talk Science* was implemented with certified bilingual teachers and their kindergarten students in nine districts across Texas. The sample of this current study consists of 202 treatment students (100 from Non-border ISD and 102 from Border ISD) and 187 control students (108 from Non-border ISD and 80 from Border ISD). All participated students were identified as ELs.

Description of Intervention and Control

Let's Talk Science (LTS; Irby et al., 2019) is a curriculum innovation with a two-level intervention for teachers and students. Level I is the direct intervention for ELs with science-infused literacy curriculum material and instructional activities. Level II is

teacher intervention, conducted via bi-weekly structured virtual professional development.

Level I Intervention: Curriculum

The Level I intervention was designed for kindergarten ELs. From the fall semester of 2016 through the spring semester of 2017, *LTS* was taught daily for 45 minutes during ESL instructional time for 28 weeks. *LTS* is an innovative curriculum designed to promote ELs' oral language development and science academic vocabulary. Phonemic awareness activities and the 5E model (Engagement, Exploration, Explanation, Elaboration, and Evaluation) were incorporated in the curriculum (Irby et al., 2019). In early grade levels, students are still at the stage of learning to read (Tong et al., 2014); therefore, *LTS* is regarded as a science-infused literacy and inquiry-based curriculum (Irby et al., 2019).

Integrated with the 5E model, the LTS is developed to support ELs' content knowledge as well as their English literacy. For example, in the phase of *Explore*, students are asked to discuss with their partners and identify photos of science related objects. In the phase of *Elaborate*, teachers led students on syllable clap out activities to support their phonemic awareness. Moreover, students need to identify the first letter of words in vocabulary cards to enhance their letter knowledge. In general, the integration of 5E model with science instruction not only facilitated students' deep understanding of the science content knowledge, but also promoted their literacy ability through enhancing their long-term memory of the science vocabulary (Irby et al., 2019).

Level II Intervention: Teacher Professional Development

Treatment teachers received bi-weekly virtual professional development (VPD), virtual mentoring and coaching (VMC) as well as virtual live classroom observation. Citrix GoTo Training (renamed as Logmein) software was used in VPD sessions to involve treatment teachers into interaction through screen sharing and chat. Each VPD session lasts 1.5 hours. The main goal of the VPD sessions was to support bilingual teacher through reflecting and discussing student learning, reviewing lesson plans and instructional materials, supporting teachers' English on pronunciation and scripts, and training English as second language (ESL) strategies. In VMC sessions for treatment teachers, bug-in-ear (two-way video) was adopted to provide support and live feedback to teachers.

Control

In control groups, students received typical ESL instruction for 45 minutes daily. Teachers in control group also received regular and typical professional development by their districts. State aligned curricula were provided to school districts. Various resources and learning strategies were also observed during ESL instruction.

Instrument

Woodcock-Munoz Language Survey Revised (WMLS-R) was applied to evaluate students' oral language development (Woodcock, Munoz-Sandoval, Ruef, & Alvarado, 2005). This standardized, individually administered test includes seven independent subtests to evaluate students' English proficiency. Cluster scores are also provided as the primary basis for intervention.

I selected scores from the oral expression cluster to assess ELs' oral language proficiency. The oral expression cluster is an aggregated method to measure ELs' expressive vocabulary, language comprehension and development, and memory. It consists of two subtests: picture vocabulary (PV, reliability is 0.95 in the range of 5-19, 0.89 in the current study) and story recall (SR, reliability is 0.76 in the range of 5-19, 0.53 in the current study). In PV, students' are evaluated on oral language, including lexical knowledge and language development. Students are required to identified picture objects in the test. SR was used to evaluate students' oral language, including listening skills, expressive language and memory. Students are required to recall as many details as possible of the stories that are presented through an audio recording. The median reliability of the oral expression cluster is 0.92 in the range of 5 to 19 years old, and 0.84 in the current study. Grade-based scale scores of oral expression cluster were used for data analysis.

Data Collection and Analysis

WMLS-R scores were collected at the beginning of kindergarten (fall 2016) and the end of kindergarten (spring 2017). The data collected at the beginning of kindergarten were treated as students' pre oral language performance, and the data collected at the end of kindergarten were treated as their post oral language performance.

Due to the hierarchical nature of this data, which indicates that students are nested within teachers and teachers are nested within school, a hierarchical linear model (HLM) was adopted to analyze this multi-level dataset. SPSS 24.0 was used for this analysis. The intra-class correlation of the HLM model was calculated with the

following formula: ICC = $\tau_{00}/(\tau_{00} + \sigma_2)$. The value of ICC of the null model was 0.46 which suggested that 46% of the variance in the ELs oral language performance can be explained by the model structure. Model specification is provided as follows.

In this model, ELs' post oral performance was the dependent variable and their pre oral performance score was added as level-1 predictor. Condition, school district location, and the interaction between these two variables were added as level-2 predictors.

Level-1 Model

$PostO_{ij} = \beta_{0j} + \beta_{1j}*(PreO_{ij}) + r_{ij}$

Level-2 Model

$\beta_{0j} = \gamma_{00} + \gamma_{01}*(Condition_j) + \gamma_{02}*(Location_j) + \gamma_{03}*(Location_{j*}\, Condition_j) + u_{0j}$

$\beta_{1j} = \gamma_{10}$

Mixed Model

$PostO_{ij} = \gamma_{00} + \gamma_{01}*Condition_j + \gamma_{10}*Pre\ O_{ij} + \gamma_{02}*Location_j + \gamma_{03}*\ Location_{j*}\, Condition_j + u_{0j} + r_{ij}$, *where*

$PostO_{ij}$ is the mean of post oral expression score for *i*th student with *j*th teacher;

β_{0j} is the expected mean score of post oral expression score of the *j*th teacher;

β_{1j} is the slope, which represents the effect of oral expression pre score on post score

r_{ij} is the level-1 residual variance that remains unexplained after controlling for covariates;

γ_{00} is the expected grand mean post oral expression score across all conditions and school locations;

γ_{01} is the main effect of intervention condition; and

u_{0j} is the level-2 residual

Results

In order to examine the effect of the science-infused literacy intervention on border and non-border school districts ELs' English oral language proficiency, I conducted a case study and adopted an HLM model to analyze the multilevel dataset. Results in Table 7 indicated that there was no statistical significance between treatment and control condition ELs regarding their pre-intervention oral expression performance. It was also indicated in Table 7 that there was a statistically significant difference between border and non-border school district ELs regarding their pre-intervention oral expression performance.

Table 7 Baseline Equivalence on Oral Expression Test by Condition

Measure	Predictor	t	*df*	Sig. (2-Tailed)	Cohen's d
Oral Expression	Condition	1.34	374	0.18	0.14
Oral Expression	Location	9.91	374	<.001	1.02

Descriptive statistics are displayed in Tables 8. In the border school district, on average, ELs in treatment condition achieved 63.93 points in the pre-intervention oral expression test, while those in control condition scored 69.13 points. At the end of intervention, border school district ELs reached 83.79 points, while their peers scored 86.93 points. In the non-border school district, ELs in treatment condition achieved 39.37 points in the pre-intervention oral expression test, while those in control condition scored 30.85 points. At the end of intervention, non-border district ELs reached 57.49 points, while their peers scored 45.23 points.

Table 8 Descriptive Statistics of Oral Expression Test by Condition and Location

Outcome	Condition	Border			Non-Border		
		N	Mean	S.D	N	Mean	S.D
OE_Pre	Treatment	102	63.93	34.9	91	39.37	30.87
	Control	80	69.13	25.77	103	30.85	28.96
OE_Post	Treatment	87	83.79	18.08	95	57.49	27.22
	Control	75	86.93	18.17	106	45.23	26.59

Results in Table 9 indicated that there was a positive and significant effect of treatment on students' oral expression performance at the end of intervention (p=.007). In addition, location was found to be a statistically significant and positive predictor (p<.001). Moreover, the interaction between condition and location was found to be a negative and statistically significant predictor (p=0.013).

Table 9 Parameter Estimates of Final Model

Fixed Effects	Coefficient	Standard Error	t (*df*)	*p*
Intercept	31.37	2.52	12.46(27)	<.001
OE Pre	0.58	0.03	17.36 (454)	<.001
Condition	7.97	2.59	3.07 (16)	0.007
Location	15.58	2.55	6.12(12)	<.001
Condition*Location	-10.61	3.43	-3.1(9)	0.013
Random Effect	Variance	Standard Error	Wald z	*p*
Intercept	66.08	27.13	2.44	0.015
Residual	170.81	13.72	12.45	<.001

Discussion

The purpose of the study was to investigate the effectiveness of a science-infused literacy intervention, *Let's Talk Science*, on kindergarten ELs' English oral language proficiency in a border and a non-border school district. I sought to answer the following research questions: (1) To what extent do kindergarten ELs receiving a science-infused literacy intervention differ from those in control bilingual classrooms in their oral English development? (2) Do ELs from a border suburban school district significantly

differ from ELs in a non-border urban school district regarding their oral language development? and (3) Does the science-infused literacy intervention better support a border school district than a non-border school district ELs regarding their English oral language development?

In response to the first research question, the results of the study suggested that in general, despite location, ELs in treatment group significantly outperform their counterparts in control group in the oral expression test, which is consistent with previous studies (Spycher, 2009; Zwiep et al., 2011) that science-infused literacy intervention had a significant and positive effect on ELs' oral language performance. The effective elements, ongoing professional development (Irby, Guerrero, Lara-Alecio, Tong, & Rodriguez, 2012), 5E model (Bybee, 2009), and the integration of science and English language development (Llosa et al., 2016) included in the curriculum, taken together, might have accounted for the difference between ELs' oral language performance in treatment and control group.

In response to the second research question, on average, students in the border district had significantly higher scores on the oral expression test at the beginning of kindergarten compared to those in the non-border school district, which is different from my findings in the second study. This result might be due to several reasons. To begin with, although, in general, border districts face certain challenges and perform lower on standardized oral language test, ELs' academic performance might be impacted by additional district-level characteristics, such as teacher turnover rate, which was verified as a significant predictor to students' academic achievement in previous study (Wang,

Tang, & Sutton-Jones, 2019). In the current case study, the border district had lower than state average teacher turnover rate while in the non-border district, teacher turnover rate was higher than average. Moreover, students' academic performance can also be highly impacted by teachers' qualification (Darling-Hammond, 2000; Harris & Sass, 2010), which could be determined by teacher training and degree level (Croninger, Rice, Rathbun, & Nishio, 2007; Harris & Sass, 2010). In this study, a higher percentage of teachers in the non-border school district lacked an educational degree compared to those in the border school districts. Also, the average years of experience for teachers in the border district was higher than the non-border district. These factors, together, suggest the teachers in the border school district have a preparation and experience advantage, and that might further positively impact students' academic performance in the district.

In response to the last research question, it was revealed in the study that within the non-border district, the gap between treatment and control conditions was widened at the post-intervention test, while within the border school districts, the gap between treatment and control groups was reduced at the post-intervention test (Figure 2). At the beginning of kindergarten, ELs in the border district already showed significantly higher performance level in oral expression test, which indicated that they were already used to and benefited from the existing school district educational resources, such as qualified teachers, curriculum, and instructional materials. In addition, border region ELs may have had unique border-crossing backgrounds and may have experienced consistent cultural conflict (Lopez, 2010). These ELs need targeted and tailored curriculum that

incorporate their culture and language background to support their development in language and content area.

The standard score scale used in WMLS-R is based on a mean of 100 and has an SD of 15. It can be interpreted that border school ELs, on average, were about 2 SDs below the mean in the beginning, and increased to only 1 SD below the mean at the end of kindergarten. In the non-border school district, ELs on average were 4 SDs below the mean in the beginning of kindergarten, and increase 1 SD at the end of kindergarten. Although there's a significant improvement, ELs are still lagging behind in terms of their English oral expression performance. Thus, it indicated that a one-year intervention might not be enough to remove the initial disadvantage of ELs; longitudinal interventions are required to better support ELs oral language development.

In sum, the impact of the science-infused intervention is more evident for the non-border district ELs with a lower initial level at the beginning of kindergarten. While in the border school district, the impact seems to be less significant to ELs, because they have already started with a higher level at the beginning of the intervention. Nevertheless, based on the results of the current study, ELs in both border and non-border districts were significantly below their monolingual English-speaking peers in oral English proficiency at the school-entry level and could benefit from a rigorous intervention that integrates English language and the content of science. I suggest that in non-border school districts, teachers should continue to practice a science-infused literacy curriculum to better facilitate their kindergarten ELs' oral language development. While in the border school districts, teachers and researchers should adjust

the science-infused curriculum and incorporate the curriculum with ELs' border crossing backgrounds and experiences to better fit the context of border region ELs.

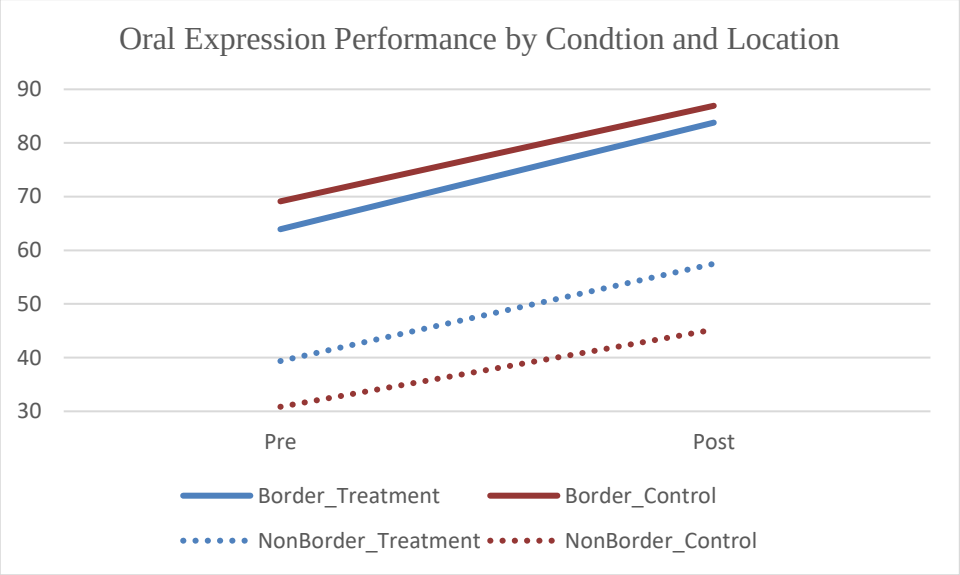

Figure 2 Post-intervention oral expression performance by condition and location.

There are certain limitations to the current study. First, it only included two districts, one border and one non-border. Thus, the findings of the current study were not generalizable to other border and non-border districts. Future research should consider the inclusion of more districts. Second, the impact of other district-level characteristics were not investigated in the study. Future studies should further examine the influence of other district-level teacher characteristics on kindergarten ELs' English oral language performance, such as teacher turnover rate and percentage of teachers holding a bachelor's degree.

CHAPTER V

CONCLUSIONS

The purpose of my dissertation was to compare Texas border and non-border school district kindergarten ELs' oral language performance and examine effective interventions to support kindergarten ELs' oral language development. The dissertation includes three journal-formatted articles.

In the first study (Chapter II), a systematic review was conducted to explore different forms of intervention that intended to support kindergarten ELs' oral language development. The initial search resulted in 109 articles searching the key words "English learner", "oral language development", and "kindergarten". After inclusion and exclusion criteria were applied, seven quantitative empirical studies remained and were included for final analysis. The systematic review summarized similar characteristics of effective interventions in terms of improving kindergarten ELs' English oral proficiency. Moreover, the study indicated that the quality of intervention is as important as the language of instruction for ELs.

In the second study (Chapter III), as indicated in previous systematic review, it is important to facilitate ELs' oral language development at kindergarten. I conducted a quantitative analysis with data from a public database to compare the growth trajectory of kindergarten ELs' oral language proficiency in Texas border and non-border school districts. A growth hierarchical linear model was adopted to analyze the state English assessment test from 2013-2018 school year. The study identified that compared to non-border school districts, Texas border school districts lagged behind in terms of the

percentage of ELs rated as intermediate and above level in 2013-2014 school year. The gap between border and non-border school district regarding the percentage of students rated as intermediate levels and above in the TELPAS speaking test persisted after five years. Based on the findings of the study, more rigorous curriculum targeted at border crossing students and ongoing professional development should be provided to border school districts teachers to facilitate their ELs' English language and content area learning.

In the third study (Chapter IV), a case study was conducted to investigate the effect of a science-infused literacy intervention on kindergarten ELs' oral language development in a Texas border and a non-border school district. The study used data retrieved from a large-scale randomized controlled trial study, project ELLA-V. *Let's Talk Science*, a two-level curriculum innovation for teachers and students, was implemented in the study. It was revealed in the study that the intervention had a significantly positive effect on kindergarten ELs' English oral language performance for both border and non-border school districts. In addition, ELs in the border school district showed better performance in oral expression compared to those in non-border school district at the end of kindergarten. The findings in the study contrast the findings in Chapter III in which border students were reported to be disadvantaged. I suggest that one of the major reasons for the contrast was the impact of other district-level demographics. The border district in this study had a higher percentage of teachers holding an educational degree, teachers with longer years of experience, and a lower teacher turnover rate. Also, the majority of ELs in this border district might had unique

border crossing experiences that required additional targeted and tailored curriculum that incorporated their backgrounds. Therefore, the impact of the science-infused intervention might be more significant to non-border school district ELs compared to border district with a higher initial level.

In conclusion, there was a statistically significant difference between border and non-border school district regarding their ELs' oral language proficiency. In general, border school students show lower oral language performance in the TELPAS speaking test with a lower percentage of ELs rated as intermediate level and above. Considering the challenges border school districts face, additional support should be provided to teachers to facilitate students' language and content learning. However, it was further found in the case study conducted in Chapter IV that ELs in the border school district performed better in oral expression test compared to those in the non-border school district. As it was stated previously, this might be due to the positive impact of other district-level teacher-related characteristics. It could also be due to the higher initial level of oral expression performance among the border school students at the beginning of kindergarten. Although there is difference between border and non-border school districts, the overall situation is that ELs still lag behind their English-speaking peers; thus, more rigorous curriculum that integrates English language and content of science along with on-going professional development for their teachers is much needed for a longer duration.

Therefore, it is important for future researchers to consider the influences of teacher turnover rate, percentage of teachers holding a degree or advanced degree,

professional development training hours, and years of teaching experience while investigating border school ELs' academic performance. Moreover, science-infused literacy intervention was found to have a significant and positive effect on kindergarten ELs' English oral language proficiency despite location. Practitioners should realize the advantages of a science-infused literacy curriculum for ELs and utilize the effective components of the curriculum in their school districts, including language and science integration and ongoing professional development for teachers. Additionally, border school districts should consider the unique border crossing experiences of students who have them into consideration and tailor the curriculum to better serve the diverse needs of all of their ELs.

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